SUPREME COURT OF THE UNITED STATES.

OCTOBER TERM, 1897.

No. 314.

THE UNITED STATES, PETITIONER,

vs.

THE BUFFALO NATURAL GAS FUEL COMPANY.

ON WRIT OF CERTIORARI TO THE UNITED STATES CIRCUIT COURT OF APPEALS FOR THE SECOND CIRCUIT.

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a [United States circuit court of appeals for the second circuit. The United States, appellant, vs. The Buffalo Natural Gas Fuel Company, appellee. Transcript of record. Appeal from the circuit court of the United States for the northern district of New York. Printed under the direction of the clerk. United States circuit court of appeals, second circuit. Filed June 5, 1893. James C. Reed, clerk.]

1 United States circuit court for the northern district of New York.

In the matter of the application of the collector of customs at Buffalo, New York, for a review of the decision of the Board of General Appraisers as to the rate and amount of duty on certain merchandise imported by The Buffalo Natural Gas Fuel Company per pipe line under Niagara River from Canada August 1st and 4th and November 21, 1891.

To the Honorable the Circuit Court of the United States for the Northern District of New York:

Your petitioner, the collector of customs for the collection district and port of Buffalo, New York, being dissatisfied with the decision made on the 20th day of May, 1893, by the Board of General Appraisers designated by the Secretary of the Treasury for and on duty at said port pursuant to the act of Congress approved June 10, 1890, entitled "An act to simplify the laws in relation to the collection of the revenues," reviewing and reversing the decision of your petitioner as to the rate and amount of duty chargeable on certain natural gas imported at Buffalo,

2 New York, from Canada by mains under Niagara River by the Buffalo Natural Gas Fuel Company, imported August 1st and 4th and November 21, 1891, and entered for consumption as fuel and for illuminating purposes by the said The Buffalo Natural Gas Fuel Company, respectfully makes application to this court and sets forth herein the errors of fact and law complained of, to wit:

The said merchandise was classified and assessed for duty as a non-enumerated unmanufactured article at ten per cent ad valorem under section four of the act of Congress passed October 1, 1890, and the entries thereof were liquidated accordingly.

The said owner and importer being dissatisfied with the decision assessing duty as aforesaid gave notice within ten days after said liquidation and ascertainment of duty, setting forth the reasons of its objection thereto, claiming the said merchandise to be exempt from duty on the ground (1) that the said importation is not an article within the meaning of the tariff act of 1890; (2) that it is free of duty as crude bitumen under paragraph 496 of said act, or (3) as crude mineral under paragraph 651 of said act, whereupon the invoices and all papers and exhibits connected therewith were duly transmitted to the said Board of General Appraisers, which Board, proceeding to hear and determine the questions of law and fact involved, reversed the collector's said decision in the premises. The record of their decision to this effect appears in a communication addressed to your petitioner under date of May 20, 1893, a copy of which is hereto attached and made part hereof and marked "A."

And for the errors of law and fact in the decision of the said Board in this regard, herein complained of, your petitioner states:

(1) That the said Board were in error in holding as matter of

3 fact that the said natural gas so imported as aforesaid was and is a crude mineral within the meaning of paragraph 651 of the

said act of October 1, 1890, and in holding that the said natural gas was a crude mineral, and that the said Board was in error in holding that the said natural gas is exempt from duty under the said tariff act of October 1, 1890.

Accordingly, your petitioner respectfully prays this court to order the said Board of General Appraisers to return to the court the record and evidence taken by the said Board, together with a certified statement of the facts involved in the case and of their decision thereon, and thereupon to proceed to review said decision and to determine the questions of law and fact involved in the same.

WM. J. MORGAN,
Collector Customs.

(G. A. 2142.) Natural gas.

Before the U. S. General Appraisers at New York, May 20, 1893.

In the matter of the protest, 8708 b, etc., of The Buffalo Natural Gas Fuel Company et al., against the decision of the collector of customs at Buffalo as to the rate and amount of duties chargeable on certain natural gas imported per pipe line August 1 and 4 and November 21, 1891.

Opinion by Wilkinson, general appraiser:

The merchandise is natural gas imported at Buffalo from Canada by mains under the Niagara River, and is used as fuel and for illuminating purposes. It was assessed for duty as a nonenumerated, unmanu-
4 factured article at 10 per cent under the act of October 1, 1890, and is claimed to be exempt from duty (1) on the ground that it is not an article within the meaning of the tariff; (2) as crude bitumen under paragraph 496, and (3) as a crude mineral under paragraph 651.

In G. A. 744 the Board considered and overruled a protest similar to this. But no evidence was introduced in support of the claims, and attention was given chiefly to the first point. We reaffirm the ruling named as to the first and second points, but a lengthy and careful investigation of the subject leads to the conclusion that the third claim in the protest is well founded.

The natural gas in question is similar to that produced in Pennsylvania and Ohio, but it was not imported prior to October 1, 1890. Consequently there are no precedents to serve as guides. Nor does it appear that at or prior to the passage of the present tariff act the dutiable character of natural gas was ever considered in or out of Congress. Nor has there ever been any trade or popular designation which would indicate its proper classification for dutiable purposes.

It is proper, therefore, to resort to the evidence of scientific experts and to other authorities bearing upon the question. In considering publications it is not believed that the date is of any moment, provided the source is impartial.

At the several hearings in New York and in Washington, D. C., the Board examined a number of well-known geologists and chemists. While there was conflict in the testimony, the preponderance of the evidence was to the effect that natural gas is a crude mineral.

Lexicographers and mineralogists give the word "mineral," in its primary and broadest sense, a definition which would embrace
5 natural gas, although their secondary and limited definitions would not. Nothing appears in the tariff, however, to show that Congress intended the narrower, and not the broader, meaning.

The question has recently been judicially determined in Canada. Section 565 of the municipal act of the Dominion empowers a township to lease or sell the right to take minerals under any highway. The town of Gosfield leased this privilege to the Kingsville Gas Company. The Ontario Gas Company asked for an injunction to restrain the sinking of the well, on the ground that natural gas is not a mineral. In his opinion, Judge Street, of the court of common pleas, stated that according to British authorities "a reservation of minerals includes every substance which can be got from underneath the surface of the earth for the purpose of profit, unless there is something in the context or in the nature of the transaction to induce the court to give a more limited meaning," and "it has been laid down that the word 'minerals,' when used in a legal document or in an act of Parliament, must be understood in its widest signification, unless there is something in the context or in the nature of the case to control its meaning. I think myself bound by the authorities to give to the word, when used in this act, its widest signification." The motion was argued May 31, 1890. (The Ontario Reports, Vol. XIX, p. 591.)

The case was carried to the court of appeals. Chief Justice Haggerty rendered the decision November 10, 1891. He said in part:

"There was hardly any attempt to rebut or dispute the accuracy of scientific nomenclature in describing minerals as solid, liquid, and gas. The objection urged was that the legislature (especially at the date
6 of the enactment) could not and did not include natural gas under the term "minerals." I can not see how we can qualify the words used by the legislature when there is nothing in the enactment to explain or limit their ordinary meaning. On full consideration, I have arrived at the opinion that our learned brother could not properly have come to any other conclusion than that natural gas falls within the meaning of minerals in the statute." (Ontario Appeal Reports, vol. 18, pp. 626–632.)

In the reports of the Census, the U. S. Geological Survey, and various State authorities, natural gas is enumerated in the list of mineral products and mineral resources.

The Statistical Abstract of the United States, prepared by the Treasury Department, gives, on pages 53–55, a table of "quantities and values of minerals produced in the United States during the calendar years from 1887 to 1891, inclusive."

In this category, under the heading of "nonmetallic," on page 54, natural gas is named third in a list of forty, which includes solids and liquids as well as gas.

We find that natural gas is a crude mineral, and sustain the claim that it is exempt from duty under paragraph 651, N. T.

7 At a stated term of the United States circuit court for the northern district of New York, held in the United States court and post-office building in the city of Albany, N. Y., on the seventeenth day of June, A. D. 1893.

Present: Hon. William J. Wallace, circuit judge.

In the matter of the application of the collector of customs at Buffalo, New York, for a review of the decision of the Board of United States General Appraisers as to the rate etc., of duty on certain merchandise imported by the Buffalo Natural Gas Fuel Company per pipe line from Canada to Buffalo, N. Y., under the Niagara River, August 1st and 4th, and November 21, 1891.

Upon reading and filing the petition herein and upon motion of D. S. Alexander, U. S. attorney and attorney for the petitioner, it is ordered that the Board of United States General Appraisers, sitting at the port of New York, return to this court the record and evidence taken by them in the above matter, together with a certified statement of the facts involved and their decision thereon.

WILLIAM J. WALLACE,
Circuit Judge.

UNITED STATES OF AMERICA,
Circuit court clerk's office, northern district of New York, Misc. No. 5.

I, William S. Doolittle, clerk of said court, do hereby certify that I have compared the annexed copy of return of record, etc., by Board of United States General Appraisers in re application for review,
8 etc., and the endorsements thereupon, with the original now on file in this office, and that the same is a correct transcript therefrom and of the whole of said original.

In testimony whereof I have caused the seal of the said court to be affixed at the city of Utica, in said district, this twenty-second day of February, A. D. 1894.

[L. S.] W. S. DOOLITTLE, *Clerk.*

In the circuit court of the United States for the northern district of New York.

In the matter of the application of the collector of customs at Buffalo, N. Y., for a review of the decision of the Board of General Appraisers as to the rate of duty on merchandise imported by the Buffalo Natural Gas Fuel Company et al. (L. S.) Suit No. 1213.

Return of the Board of United States General Appraisers to the order of Hon. William J. Wallace, circuit judge.

Dated New York, September 13, 1893.

The Board of United States General Appraisers, sitting at New York, in response to the order of the court in the above matter, make the following return of the record and evidence taken by them in the above matter, and of the facts involved therein, as ascertained by them.
9 They state that on the sixth day of August, 1891, a letter dated August 5, 1891, a copy of which is hereto annexed and marked

"Exhibit E," was received from the collector of customs at Buffalo, submitting under the provisions of section 14, of the act of June 10, 1890, the protest described and marked as follows:

EXHIBIT F.

Coll.'s No.	Board No.	Protester.	Vessel.	Date of entry.
	8708-B.	The Buffalo Nat'l Gas Co.	Pipe Line.	Aug. 1/91.

EXHIBIT E. 8708/11-B.

CUSTOM-HOUSE, COLLECTOR'S OFFICE,
Buffalo, N. Y., August 5, 1891.

Hon. BOARD OF GENERAL APPRAISERS,
534 Canal street, New York:

GENTLEMEN: I have the honor to submit herewith four protests of the Buffalo Natural Gas Fuel Company against my action in assessing duty at the rate of ten per cent ad valorem on certain natural gas imported by them from Canada, per pipe line, on the 1st, 2d, 3d, and 4th instants.

My action is in conformity with the decision rendered by your honorable body July 10, 1891, in which you sustain my action in assessing duty at the said rate upon a former importation of gas by them. I enclose invoices and copies of entries.

Very respectfully,

WM. J. MORGAN, *Collector.*
Pr. WM. E. CLARKE, *Special Dep'y.*

10 (Indorsed:) Customs House, Collector's Office, Buffalo, N. Y., August 5, 1891. Wm. J. Morgan, collector. Natural gas. Subject: Enclosing four protests of the Buffalo Natural Gas Fuel Co. against assessment of duty.

Office U. S. General Appraisers, New York. Received August 6, 1891. No. of inclosures, 8. E. O. W.

EXHIBIT F. 8708-B.

BUFFALO, N. Y., *August 4, 1891.*

Hon. WM. J. MORGAN, *Collector of the Port of Buffalo Creek, N. Y.:*

DEAR SIR: We hereby protest against your action in assessing duty at the rate of ten per cent ad valorem on a certain importation of 1,000,000 feet of natural gas, imported by us from Fort Erie, Canada, August 1, 1891, by pipe line, and for which entry was made by us and duty paid at said rate on the first day of August, 1891, under section 4 of the tariff act of October 1, 1890, as a raw or unmanufactured article not enumerated, as provided for in said act, and also against such classification of said gas, for the reason (1st) that said natural gas is not an "article" within the meaning of the tariff act; (2d) that said gas is a crude bitumen, and exempt from duty under paragraph 496 of the said act, and (3d) that said gas is a crude mineral, and exempt from duty under paragraph 651 of the said act.

Respectfully, yours,

THE BUFFALO NATURAL GAS FUEL CO.,
By JOHN MCMANUS, *Sec'y.*

(Indorsed:) Buffalo Natural Gas Fuel Co. Protest against
11 exaction of duty on natural gas. Date of importation, August 1, 1891. Date of entry, August 1, 1891. Date of liquidation, August 4, 1891. District of Buffalo Creek, received August 5, 1891. Port of Buffalo, N. Y.

They state that on the 4th day of December, 1891, a letter dated December 3, 1891, a copy of which is hereto annexed and marked "Exhibit G," was received from the collector of customs at Buffalo, submitting under the provisions of section 14 of the act of June 10, 1890, the protest described and marked as follows:

EXHIBIT H.

Coll.'s No.	Board No.	Protester.	Vessel.	Date of entry
770	11216-B.	Erie County Nat'l Gas Fuel Co., L'd.	Pipe Line.	Nov. 21/91.

EXHIBIT G.

CUSTOM-HOUSE,
Port of Buffalo, N. Y., December 3, 1891.

I submit herewith the protests described below, with the accompanying invoices and entries against my assessment of duty of ten per cent ad valorem on certain natural gas claimed to be exempt from duty returned by the appraiser as a raw and unmanufactured article, and assessed with duty under section 4, act of October 1, 1890, in accordance with G. Appraiser's ruling of July 10, 1881, S. S. 11569. The requirements of section 14, act of June 10, 1890, have been complied with by the protester.

Respectfully, yours,

WM. J. MORGAN,
Collector of Customs.

12 To the BOARD OF U. S. GENERAL APPRAISERS, *New York:*

No.	Name of importer.	Vessel.	Date of entry.
11216-B 770	Erie County Natural Gas Fuel Co., L't.	Pipe Line.	Nov. 21, 1891.
11217-B 771	"	"	" "
11218 772	"	"	" "
11219 773	"	"	" "
11220 774	"	"	" "
11221 775	"	"	" "
11222 776	"	"	" "
11223 777	"	"	" "

NOTE.—In transmitting protests, the requirements of article 63, regulations of August 7, 1890, should be strictly complied with. The number of inclosures should always be stated, and, in counting the same, each separate detached paper, or group of papers (fastened together by pins, mucilage, or otherwise), should be counted as one. No. of enclosures, 11216/23-B.

(Indorsed.) Port of Buffalo, N. Y., December 3, 1891. Wm. J. Morgan, collector of customs. Natural gas. Transmits protest of Erie County Natural Gas Fuel Co., Limited. Office U. S. General Appraisers, New York. No. of enclosures, 8. Received December 4, 1891. 16 rec'd. E. O. W.

EXHIBIT H. 11216–B

BUFFALO, N. Y., *Nov. 28, 1891.*

Hon. WM. J. MORGAN,
Collector of the Port of Buffalo Creek, N. Y.:

DEAR SIR: We hereby protest against your action in assessing duty at the rate of ten per cent ad valorem on a certain importation of
13 3,995,000 feet of natural gas, imported by us from Fort Erie, Canada, November 15, 1891, by pipe line, and for which entry was made by us and duty paid at said rate on the 21st day of November, 1891, under section 4 of the tariff act of October 1, 1890, as a raw or unmanufactured article not enumerated as provided for in said act, and also against such classification of said gas, for the reason (1st) that said natural gas is not an "article" within the meaning of the tariff act; (2d) that said gas is a crude bitumen, and exempt from duty under paragraph 496 of the said act, and (3d) that said gas is a crude mineral, and exempt from duty under paragraph 651 of the said act.

Respectfully, yours,

ERIE COUNTY NATURAL GAS FUEL CO., LTD.,
By M. G. HUGHSON, *Atty.*

(Indorsed:) Erie County Natural Gas Fuel Co., Ltd. Protest against assessment of duty of ten per cent on certain natural gas imported from Fort Erie, Canada, per pipe line, claimed to be exempt from duty. Date of importation, October, 1891. Date of consumption entry, Nov. 21, 1891. Date of liquidation, Nov. 27, 1891. Adjustment of October importation. District of Buffalo Creek, received Dec. 1, 1891, port of Buffalo, N. Y.

The Board further state that the testimony of certain witnesses was taken by them in this manner on the 22d day of April, 1892, July 1, 1892, July 2, 1892, January 11, 1893, and May 12, 1893, and the same is returned herewith and marked "Exhibits I, J, K, L, M," respectively. That there is also returned herewith, marked "Exhibit N," a statement of certain citations from authorities and other matters presented
14 by Dr. F. P. Vandenbergh, of Buffalo, New York, in accordance with a stipulation made at the hearing of April 22, 1892. (See page 101 of testimony.)

There are also returned herewith, in a separate inclosure, certain samples used before the Board and on the examination of the witnesses, marked "Exhibits A, B, C, and D," 8708/11B, Government Exhibits "1, 2, 3, 4, 5, 6, 7, and 8," and also a sample of Maltha and statement of Dr. F. P. Vandenbergh aforesaid in regard to same, submitted to the Board under a stipulation dated April 22, 1892. (See page 98 of testimony.) Said sample is marked "Exhibit T."

That there are also returned herewith, marked "Exhibit O," certain printed advertisements taken from a copy of the Oil, Paint, and Drug Reporter, dated October 31, 1892, which are referred to in the testimony taken January 11, 1893, in 11216/23–B.

EXHIBIT I.

Before the Board of United States General Appraisers. Special hearing by General Appraiser Wilkinson. In the matter of the protests of the Buffalo Natural Gas Fuel Co., 8708/11–B. New York, April 22, 1892, eleven o'clock a. m. T. E. H. Barrington, stenographer. Natural gas. Statement by Mr. Herbert P. Bissell (counsel for the importer):

It is stipulated that the evidence here offered shall apply to protests hereafter to be filed, claiming that the gas should be admitted duty free, because it is a crude paraffine as well as a crude bitumen, and as such and of itself is a crude mineral not advanced in value or condition by manufacture.

15 Dr. F. P. VANDERBERGH, being called as a witness, and being first duly sworn, testifies as follows:

By Mr. BISSELL (on behalf of the importer):

Q. Do you reside in Buffalo?
A. Yes, sir.
Q. And are an analytical and consulting chemist?
A. I am.
Q. For how long a time have you been such?
A. For about five years.
Q. For how long a time have you studied chemistry?
A. Since 1875, in connection with my other duties.
Q. You are a physician also.
A. A graduate in medicine.
Q. You have occupied a chair in the Buffalo University, have you not?
A. Yes, sir.
Q. What was that?
A. Professor of chemistry and toxicology.
Q. Before that you were a lecturer?
A. Yes, sir.
Q. For how long a time were you connected with the Buffalo University in one or other of these capacities?
A. Was appointed lecturer on chemistry in November, 1883, and professor of chemistry in the spring of 1886.
Q. How long did you continue to be connected with the university?
A. Until the summer of 1890, actively; I have a nominal chair now, but am not actively engaged.
Q. You have been until recently city chemist in the city of Buffalo, have you not?
A. Yes, sir.
Q. How long were you city chemist?
16 A. I began the duties of city chemist in the beginning of 1886, and in 1887 received the appointment, which I held until February of this year.
Q. Now, Doctor, you have made an analysis, have you not, of the natural gas which is imported by the Buffalo Natural Gas Fuel Company from Canada?

A. I have made analysis of the sample taken at the pressure house of the Buffalo Natural Gas Fuel Company at the foot of Austin street, Buffalo.

Q. You took the sample yourself, did you?

A. Yes, sir.

Q. And you know that it is the Canadian gas, or, at least, that it came from the pipe which crosses the river at the point you mention?

A. Yes; it is said to have come from Canada.

Q. And you took it from the pressure house?

A. Yes, sir.

Q. You took the sample yourself, did you?

A. Yes, sir.

Q. How?

A. By connecting with the mains described by John McManus, secretary of the company, to have come from the Canadian gas fields, with a steel cylinder about four feet six inches high and about a foot to fifteen inches in diameter, capable of withstanding a pressure of about two hundred pounds to the square inch, which cylinder was several times filled with the gas from the mains within the pressure house and discharged by releasing the pressure. The cylinder was then refilled and conveyed to my laboratory in Buffalo and the analysis of the gas made under the pressure and temperature of the room, namely, 746 millimeters barometic pressure and 20 degrees C. temperature.

Q. You made a complete and careful analysis, did you, of the sample of gas taken?

17 A. Yes, sir.

Q. What does it contain?

A. The gas was found to contain methane, being marsh gas 95.6 per cent, ethylene, propylene, and butylene 1.6 per cent, carbon monoxide 0.2, carbon dioxide 0.6 per cent, hydrogen 0.6 per cent, oxygen 0.8 per cent, and nitrogen 0.6 per cent.

Q. Doctor, will you please state from your analysis and from your other investigations of this subject what is the natural gas?

A. Natural gas is a mixture of methane CH_4 or marsh gas with a small proportion of carbon monoxide, carbon dioxide, oxygen, and usually a small but variable quantity of hydrocarbons other than methane, principally ethylene, propylene, and butylene.

Q. How should it be classified?

A. Chemically as a crude paraffine, especially because it consists almost entirely of methane, and in some instances within one per cent of the total being methane, which is the most common and is the substance taken as a type of all paraffines. The paraffines are a series of definite chemical compounds which consists of hydrogen and carbon and which differ from one another in the relative proportion of carbon and hydrogen in the definite compound.

The difference in composition, and therefore in physical and chemical proportion, is so exact that these substances may be grouped in a series consisting of quite a large number of these paraffines or hydrocarbons, and when so arranged in a series they are found to differ from each other in composition by CH_2 more or less; that is, the first and most common member of the series—methane or marsh gas—has the formula CH_4, the

next has the formula C_2H_6, the third C_3H_8, and so on through the
18 series, each subsequent member containing one atom of carbon and two atoms of hydrogen more than the preceding member.

All of these hydrocarbons are known as paraffines, and any substance which contains these or a large proportion of any or several of them is known as a crude paraffine. Marsh gas or methane is the most common of these and the first in the classification referred to above. It is a light, colorless, almost odorless inflammable gas. With each increment of CH_2 the density increases, until the substance becomes liquid, subsequently viscous, semisolid, and finally of a hard, compact substance, solid at all ordinary temperatures. As the quantity of carbon and hydrogen increases in these substances, the melting point and the boiling point increase.

Q. You are showing a comparison between methane and marsh gas?

A. Those are identically the same article—methane is the chemical name and marsh gas the common name.

Q. What is the purpose of this full statement you have just made?

A. This statement is for the purpose of showing the relation which methane or marsh gas, of which the natural gas examined contained 65.6 per cent, to the other paraffines?

By Col. WILKINSON:

Q. Is methane known as an elementary substance?

A. No; methane is not an elementary substance, because the term "element" or "elementary" is reserved for all of those substances which can not be further subdivided by any means whatever. For instance, iron, copper, gold, silver, carbon, and oxygen are elements.

Q. What are the constituents of methane?

A. One atom or one part of carbon to every four parts of hydrogen.

19 By Mr. BISSELL. In your opinion as an expert, Doctor, the natural gas examined by you is crude paraffine, is it?

A. Yes, sir.

Q. And that is shown by the analysis showing its composition?

A. Yes, sir.

Q. You say that it is composed chiefly of methane?

A. Yes, sir.

Q. What proportion of other matters or other substances is there outside of methane—what percentage?

A. About four and a half per cent of other hydrocarbons closely related to paraffine and other gases.

Q. If natural gas consisted only of methane it would be pure paraffine?

A. Yes, sir; typically paraffine.

Q. But being also accompanied by this percentage of other matter makes it crude paraffine?

A. They are in the nature of impurities, and therefore make it crude paraffine.

Q. Well, now, is that all you have to say on the subject of natural gas as a crude paraffine?

A. That is all that occurs to me at present.

Q. In your opinion, you have also testified that the natural gas examined by you is also a crude bitumen?

A. I did not think I had so testified as yet.

Q. Please state whether or not it is.

A. Yes; I consider the natural gas examined is a crude bitumen.

Q. And for what reason?

A. For the reasons that bitumens are mixtures of hydrocarbons of various kinds mixed with other materials in varying proportions; a crude bitumen as found in nature is mixed with other materials.

Q. What percentage of natural hydrocarbons does this natural gas contain?

A. 97.2 per cent.

20 Q. What do you say of the remaining 2.8 per cent?

A. They are substances usually found with the hydrocarbons in crude bitumens.

Q. Now, referring to your memorandum, will you please state whether or not bitumen is a generic term?

A. The term bitumen does not refer to any substance of definite chemical composition, but is distinctively a generic term applied to a large number of natural substances which consist largely or chiefly of hydrocarbons. These substances may be gaseous, as natural gas or marsh gas; fluid, as petroleum or naphtha; viscous, as the semifluid asphaltum; elastic, as elæterite (found in Utah and elsewhere); solid, as some forms of asphaltum, bituminous or anthracite coal.

Q. You have prepared a table, have you not, in your memorandum there which shows this?

A. Yes, sir.

Q. Will you kindly hand that to the stenographer that he may copy it?

(Stenographer copies memorandum as follows:)

Bitumen:	Gaseous	Marsh gas, Natural gas.
	Fluid	Naphtha, Petroleum.
	Viscous	Mineral tar, Brea, Chapapote.
	Elastic	Elastorite, Wurtzilite.
	Asphalt	Alberite, Grahamite, Uintaite.
Solid:	Coal	Bituminous coal, Semibituminous coal, Anthracite coal.

21 Q. Will you proceed, Doctor, and state why these are crude bitumens, in your judgment.

A. That is briefly the definition and the common composition of crude bitumens which are naturally classified as given above. These deposits of bitumen occur in various portions of the earth's crust; they differ naturally in appearance, in consistency, in various physical and chemical properties, but they are everywhere found to consist essentially of hydrocarbons.

Q. And they are correctly designated as bitumens?

A. They are correctly designated as crude bitumens.

Q. This natural gas could be correctly designated, could it, as crude bitumen?

A. I think it should be designated as a crude bitumen, as given in the table.

By Col. WILKINSON:

Q. You hold that paraffine is a subdivision of a class of articles known as bitumen, do you?

A. Not necessarily, but both bitumens and paraffines are subdivisions of the general class of hydrocarbons, and the bitumens usually contain a large proportion of paraffine.

Q. How is it that you give them, one article (natural gas), the two names of paraffine and bitumen?

A. Because its chief constituent is methane, of which it contains 95.6 per cent, and this is, as previously stated, the most common, and, in fact, the typical paraffine containing other hydrocarbons, etc., to the amount of 4.4 per cent, and it is a crude paraffine.

The bitumens are like the paraffines, always hydrocarbons. The natural gas is a crude bitumen by reason of its being a paraffine containing 95.6 per cent of methane, and also by further reason of its containing 1.6 per cent of other hydrocarbons.

22 There is no conflict in the classification under these two terms.

For instance, matter in general is made up of elements or compounds, and mixtures or compounds of these. Now, the most numerous class of compounds among natural or artificial substances are those which consist of carbon and hydrogen alone. These hydrocarbons exist in nature and artificially in a very great number of proportions, and the paraffines are one series of hydrocarbons; the bitumens a still larger class of hydrocarbons, which include the paraffines, but, unlike the paraffines, is not limited to one particular class of hydrocarbons, namely, that having generic formula C_nH_{2N} plus 2.

The point is, that bitumen includes paraffine; in other words, all of the paraffines are bitumens.

I should like to be understood as stating that paraffine is a generic term, since it is applied to a large class or series of substances, each of which has a definite chemical composition, and that bitumen is also a generic term, since it includes these paraffines and an additional number of hydrocarbons not included by the term paraffine.

By Mr. BISSELL:

Q. Is there any reason that occurs to you that you should give here as an expert why natural gas is a crude bitumen, additional to what you have already given. You have samples, have you, of the different bitumens?

A. Yes, sir [introducing samples].

(Samples offered in evidence. Admitted and marked "Exhibits A, B, C, and D, 8708/11–B," April 22d, 1892, respectively.)

This (Exhibit A) is Trinidad asphalt from the so-called Pitch Lake. Exhibit B is a refined bitumen from the so-called Pitch Lake in the Island of Trinidad. Exhibit C is a sample of crude liquid bitumen from Canada. Exhibit D is a glass flask containing natural gas imported into Buffalo.

23 Q. This natural gas imported into Buffalo is invisible, is it?
A. Yes, sir.

(It is stipulated that the witness may send to the board a sample of semiliquid crude bitumen taken from the so-called Pitch Lake in Trinidad Island, which is scientifically termed "maltha.")

By Mr. BISSELL:

Q. Is there any other point in connection with the claim that this Canadian natural gas is crude bitumen that occurs to you we should know?

A. Nothing further occurs to me at this time, except the fact that the substance in question is a gas instead of a solid or semisolid is not material to the designation; the composition, not the consistency of the substance, determines the application of the term.

Q. Determines its designation?

A. Yes; designates the substance.

Q. Is that all you have to say on the subject?

A. That is all that occurs to me at present.

Q. State, if you please, whether or not, in your opinion, this gas is a crude mineral.

A. In my judgment it is of itself, and in common with all other crude paraffines, such as ozocerite or mineral wax, or crude bitumen, such as grahamite, which is that substance [indicating a specimen not in evidence], uintaite, alberite, and all other crude bitumens or asphalts. It is a crude mineral. I do not think that it is necessary that a substance shall be solid, hard, crystalline, and of definite geometric form in order to be a mineral.

By Mr. BISSELL:

Q. Is there anything further that influences your opinion that this natural gas is a crude mineral, except other authorities, which I will ask you to quote later?

24 A. Yes; the fact that it is a substance obtained from the surface structure of the earth without being subjected to artificial treatment, such as refining or chemical process of any kind which would change its natural composition. It is obtained from the mineral portion of the earth, and issues or flows from it more rapidly, of course, but still in a manner comparable with the way in which maltha, asphalt, and other crude bitumens ooze or issue from the earth.

Q. Is that all that occurs to you as to why this substance should be classified as a crude mineral?

A. That is all that occurs to me at present, except such information which applies equally to the conclusions with reference to its being a crude paraffine and a crude bitumen; and that is, concensus of opinion of other chemists whose investigations and experience entitles their judgment to confidence.

Q. You have made a thorough investigation of the authorities on this subject, have you?

A. Yes, sir.

By Col. WILKINSON:

Q. Will you please give me the chemical composition of cotton?

A. That is what is known as cel'ulose chiefly.

Q. By what figures—how is it represented in chemistry?

A. It is not a definite chemical substance, and therefore can not be represented by any formula.

Q. How would you represent starch?

A. That would be represented by a chemical formula, because it is a definite chemical substance.

Q. What is the formula?

A. There are quite a number of starches, and no one formula is applicable to more than one of these starches. The term starch is a generic term—common starch has the formula $C_6H_{10}O_2$.

Q. What is the formula of sugar?

25 A. That is another of the same kind which is very closely related; the formula is $C_{12}H_{22}O_{11}$.

Q. In many cases the composition of the formula of sugar is identical with that of starch, is it not?

A. There are some sugars and some starches which have similar percentage composition, but the formulas are different—that is, both the percentage composition of starch and sugar would be the same. That is, the proportion of carbon and the proportion of hydrogen and oxygen, of which substances both sugar and starch consist only, in which they are grouped together, wherein the percentage would be different and is different. The percentage might be the same and is the same in certain starches and in certain sugars; but when you come to examine still more closely and find how that oxygen and hydrogen and carbon is grouped into these little particles which make up the mass, it is not the same, so that while the percentage composition might be the same the formulas are not identical.

Q. You have made, have you, Doctor, a thorough investigation of what is published relating to natural gas, for the purpose of determining its proper classification?

A. I have examined literature and have a few abstracts with comments of quite a number of authorities.

Q. Will you please cite to the Board some of the authorities that you have found and what they say on this subject. What is the chief authority that you have consulted?

A. I think the author who is most authentic in designating and considering natural gas as a crude bitumen is Professor S. F. Peckham, who is special agent in charge of the technology of petroleum and its products to the 10th United States Census, made in 1885, an exhaustive

26 report concerning not only petroleum but natural gas and other bitumens, in which natural gas was considered historically, chemically, geologically, technologically, and commercially as a crude bitumen. On page three of this report——

Q. Of course Prof. Peckham's examination was not of Canadian gas?

A. No.

(It is stipulated that Dr. Vandenbergh may file as a part of his evidence citations from authorities and any other matters he wishes to lay before the Board, to be furnished on or before May 4, 1892.)

By Mr. BISSELL:

Q. Now I would like to ask you as to the examination of the gas by Professor Peckham—his examination was not of course of the Canadian gas?

A. There is no reference to that, and my impression is that this is the first analysis of Canadian gas which has been made public (referring to analysis made by himself). Professor Peckham's analysis was made of the sugar—of Pennsylvania gas, Ohio, Indiana, and various other gases.

Q. Please state how that gas compares with the gas you have analyzed.

A. The composition of the Canadian and the Pennsylvania gas is substantially the same.

Q. The table you refer to, showing the analysis of the Pennsylvania gas, you have taken from Prof. Peckham's work?

A. Yes, sir; and also analysis made by Professor Sadler, of the University of Pennsylvania.

JOHN MCMANUS, being called as a witness and being first duly sworn, testifies as follows:

By Mr. BISSELL:

Q. Mr. McManus, you reside in Buffalo and are secretary of the Buffalo Natural Gas Fuel Company, are you not?

27 A. Yes, sir.

Q. And have been since the organization of the company?

A. Yes, sir.

Q. Did you in the month of December or January go with Dr. Vandenbergh one night to the pressure house to take a sample of the gas imported by your company from Canada?

A. I did.

Q. At the point where it enters this country?

A. Yes, sir.

Q. And you are familiar with the laying of the pipes and the importation of this gas?

A. Yes, sir.

Q. Do you know of your own knowledge whether or not this sample which was taken was the Canadian gas imported by you?

A. It was.

Q. You know that?

A. Yes, sir.

Q. Where does this gas come from in Canada, Mr. McManus?

A. In the vicinity of Shirkston.

Q. How far is it from Fort Erie?

A. It is about twelve miles west from Buffalo.

Q. And how is the gas obtained?

A. By drilling.

Q. Drilling into the earth?

A. Yes, sir; and it is conveyed through pipes.

Q. And then how is it piped?

A. The pipes are laid along the earth and across the Niagara River.

Q. Is it refined in any way?

A. No, sir.

28 Q. It is imported into Buffalo and afterwards used there in the same form as it is taken from the earth?

A. Precisely.

By Mr. ALEXANDER:

Q. It is used just as it comes from the well, is it?

A. Yes, sir.

Q. And it is treated the same as that which is piped into Buffalo from Pennsylvania?

A. Exactly.

Q. Has your company had any analysis made of the Pennsylvania natural gas?

A. Well, I can't say positively as to that; the Buffalo Natural Fuel Company has not, to my knowledge, had any.

By Mr. BISSELL:

Q. Do you find the Pennsylvania gas insufficient to supply the consumers in Buffalo?

A. Yes, sir.

Q. And for that reason you have looked around for another point from which to obtain gas?

A. Yes, sir.

Q. And went into Canada for that purpose?

A. Yes, sir.

By Mr. ALEXANDER:

Q. Are there any stoppages of this gas from the time it leaves the well until it reaches Buffalo, this side of the river?

A. Its flow is intercepted and the pressure reduced.

Q. On the other side?

A. On the other side; yes, sir.

Q. But your mains are not tapped?

A. No, sir.

(It is stipulated that if the Board desires, Dr. Vandenbergh will submit matters for cross-examination at any time agreeable to the Board.)

29 EXHIBIT J.

Before the Board of U. S. General Appraisers. Special hearing by Col. Wilkinson. In the matter of the protests of the Buffalo Natural Gas Fuel Company, 11216/23–B. New York, July 1, 1892. T. E. H. Barrington, stenographer.

EDWARD SHERER, called as a witness and being first duly sworn, testifies as follows:

By Mr. ALEXANDER, on behalf of the Government:

Q. Where do you reside, Doctor?

A. Reside at Garden City, New York.

Q. What is your business?

A. Chemist, in charge of the United States laboratory at the appraiser's office, port of New York.

Q. How long have you been in charge?

A. Since 1880.

Q. How long have you been connected with the office?

A. During the entire time I have been in charge—ever since 1880, with the exception of eighteen months.

Q. Prior to that period?

A. I have been chemist, practicing the profession of chemistry—analytical chemist—in New York since 1872.

Q. You read the evidence given by Dr. Vandenbergh on behalf of the importer of natural gas into Buffalo?

A. I have read it; yes.

Q. Do you agree with his view of natural gas, such as is imported into Buffalo, being a paraffine?

A. Chemically speaking, the term paraffine applies to the gas and to the liquid and to the solid substances, and the generical term
30 paraffine undoubtedly applies to that series of bodies which are generically known as paraffine, and to that extent I should certainly agree with him, from a chemical point of view, that a liquid, solid, or gas having this composition would be called a paraffine. The beginning of the series in this is generally called marsh gas, and there are a large series of these bodies which are homologues of the marsh gas. The lowest of these series is in the form of gas, but the highest is a solid form. Some are in liquid forms, and it is largely a matter of temperature and pressure or solid form, but I regard the article designated as paraffine as differing from the paraffine that are in this series, for the reason that it is the product of the distillation of petroleum and has a physical composition differing from that of the natural paraffine in the solid form. I think it generally conceded that the solid paraffine in its natural condition is an amorphous body, while paraffine or paraffine wax, it is known—a product of distillation of petroleum or any similar body—is a crystalline structure, and differs in its physical character from the natural paraffine; it is an isomer of that; it has the same chemical composition, but differs physically. I should regard the testimony of the professor there as being, from a scientific and chemical standpoint, entirely true.

Q. Are you acquainted with any substance known commercially as paraffine?

A. I have seen the article which is commercially called and known as paraffine.

Q. What is it?

A. It is a product of the distillation of petroleum. If the object of the distiller of petroleum is to make paraffine, it is so constructed as to get the greatest possible result of the products of the petroleum, yet in the main it is chemically the composition of one of these series of so-called paraffine.

31 By Col. WILKINSON:

Q. How many different grades in the paraffine series?

A. I could not tell you from memory.

Q. Well, about?

A. I should hardly like to give a guess; I really don't know.

Q. Think there are as many as twenty?

A. I should think it quite probable.

Q. You say there is a number?

A. A number, yes.

Q. In that number how many of the grades are known distinctly as paraffine; is there more than one?

A. Only one, I should judge, would have that designation—that would be the highest form, the white waxy substance.

Q. Is the liquid form known as paraffine?

A. Generically; yes, it is a paraffine.

Q. What formula represents paraffine in its gaseous state; do you remember, Doctor?

A. I think it is the formula for marsh gas, CH_4.

Q. What formula, do you remember, would represent paraffine as it is known commercially?

A. I have not in mind what the formula is; it is one of that series of homologues—that progressive series of combinations of carbon and hydrogen in specific proportions.

By Mr. ALEXANDER:

Q. Does the word paraffine cover all these different series when considered commercially?

A. I should not say that it did cover anything but the one article commercially known as paraffine.

By Mr. BISSELL:

Q. Have you examined into the commercial designation of natural gas?

32 A. I have had no commercial experience; I have not dealt commercially with the trade of those articles.

Q. You have made no investigation commercially of paraffine, natural gas, or any of these substances you are talking about?

A. No, sir.

By Mr. ALEXANDER:

Q. You recall generally the testimony of Dr. Vandenbergh respecting natural gas classified as a crude mineral, do you, Doctor?

A. I remember that portion of his testimony; yes, sir.

Q. Do you agree with him on that point?

A. I should not regard natural gas as a crude mineral.

Q. What is crude mineral, as you understand it?

A. An inorganic substance, mined or obtained by mining, would be the generally accepted definition, I think, of a mineral substance.

Q. Then, in your opinion, could a gas or a liquid be called a mineral?

A. Not properly, no, sir; I think not.

By Col. WILKINSON:

Q. How about quicksilver, Doctor?

A. That is not a liquid; it is not a gas.

By Mr. BISSELL:

Q. How long have you known of natural gas being imported into this country?

A. I can't say I have had any knowledge that it was an imported article prior to hearing of this case.

Q. You have made no analysis of the goods yourself?

A. No, sir.

Q. You took the analysis made in the doctor's statement?

A. Presumed that analysis was a correct one.

33 Q. Then it is about the same as the gas in Pennsylvania?

A. My impression is that it doesn't differ materially from that.

Q. Is not this obtained by mining?

A. I am not informed as to how it is obtained.

Q. You don't know that they drill into the earth for it just as they drill in mines?

A. I presume that they bore for it; would not call that a process of mining.

Q. What is the difference?

A. In mining it would be necessary to take out the substance mined. I can't understand gas being mined. Of course, it can't be handled; it can't be sold by the ton. It can be treated as a mining substance.

Q. It can be measured, can it not?

A. Can be measured, yes.

Q. And can be weighed?

A. Can be weighed, certainly.

Q. They dig into the earth sometimes a thousand feet and sometimes two thousand feet and sometimes greater?

A. I am not familiar at all with the process of getting it.

Q. If they undertook to get it out of the earth and bore for it anywhere from a thousand to two thousand feet, in the same way that they drill a hole to obtain silver, that would be a process of mining, would it not?

A. Never heard of drilling a hole to obtain silver. They usually sink shafts; I am not an expert on mining operations.

Q. Have you ever been around the gas fields of Canada?

A. No, sir.

Q. Those of Pennsylvania?

34 A. No, sir.

Q. Never seen the way they drill for gas?

A. Never have.

Q. Isn't it true, Doctor, that the substances that go into a mineral determine whether or not it is a mineral?

A. Yes, that is probably true.

Q. It is not necessary that a mineral should be any particular shape or be a solid, is it?

A. The accepted definition of a mineral is, something that has a solid form that can be weighed and handled. I would draw the distinction between this gas and a mineral on this point mainly. It is not an inorganic substance and is not what would be ordinarily accepted as a mineral.

Q. A chemist would accept it as a mineral, would he not?

A. I don't know.

Q. Determine it by substance, wouldn't he?

A. I should not accept it as a mineral from a chemical standpoint.

Q. It would be only one form of a mineral?

A. I am not basing my judgment that gas is not a mineral from the fact that it is in the form of gas entirely.

Q. It could be a mineral and be in the form of gas, could it not?

A. Undoubtedly, it could be a mineral in the form of gas.

Q. And provided it contained the substance to make it a mineral, it would be a mineral in the form of gas?

A. Yes.

Q. And yet minerals are generally recognized in their solid form only?

A. A mineral can be converted into a gas.

35 Q. Then there is the liquid form of mineral?

A. Yes, sir; it can be liquified.

Q. Quicksilver is a mineral, is it not?

A. Yes, sir.

Q. And it is a liquid?

A. Yes, you can call it a liquid, I suppose, though it is rather a stretch to.

By Mr. BISSELL:

Q. Doesn't this gas, as shown by the analysis of Dr. Vandenbergh, contain a substance which would constitute a mineral?

A. No, sir.

Q. What does it contain?

A. Carbon and hydrogen and generally organic substances, so far as my recollection of the analysis goes.

By Col. WILKINSON. You say, Doctor, you think the distinctive feature of a mineral is that it is organic?

A. Yes, sir.

Q. Is coal inorganic?

A. No, coal is organic.

Q. Isn't it a mineral?

A. It would not come under that definition.

Q. Is it not a mineral?

A. It is certainly so called, but it is outside of the strict definition of a mineral; yet it is spoken of course, as a mineral, and yet it is not, strictly speaking, a mineral, because it is an organic substance. You will find in Webster's Dictionary the generally accepted definition of a mineral, and I think it would sustain my views.

By Mr. BISSELL:

Q. What does the gas virtually contain, as shown by Dr. Vandenbergh's analysis?

A. Methane, marsh gas.

Q. What is methane, or marsh gas?

A. It is a mixture of carbon and hydrogen.

36 Q. Is that a bituminous substance?

A. In some forms it is. The term bituminous is used in a very similar sense to paraffine as describing a class of bodies.

Q. Do you agree with Dr. Vandenbergh that the gas is a bitumen?

A. In that sense it is.

Q. You also say, generically, it could be named a paraffine?

A. Yes, sir; both a bitumen and a paraffine.

Q. It is properly classified as bitumen scientifically, is it, Doctor?

A. In the same sense as it is properly classified as a paraffine.

By Mr. ALEXANDER:

Q. But it can be classified as a paraffine or a bitumen only from a chemical and scientific standpoint; is that your view?

(Question objected to. Objection sustained by the Board.)

By Mr. BISSELL:

Q. Doctor, have you investigated to see how natural gas is classified in the United States census reports, and how it is treated in the mineralogical reports in the country?

A. I have not read that portion of the documents attached to the testimony and have not seen it.

Dr. HAYDEN BAKER, called as a witness and being first duly sworn, testifies as follows:

By Mr. ALEXANDER:

Q. You reside in New York, Doctor?

A. I reside in Brooklyn.

Q. What is your profession or business?

A. I am a chemist, employed at the Government laboratory connected with the appraiser's stores.

Q. How long have you been so employed?

37 A. Over twelve years.

Q. How long has your profession been that of a chemist?

A. I began the study of chemistry in 1855 and have been studying from that time to the present.

Q. Have you examined the testimony of Dr. Vandenbergh given on behalf of the importer of natural gas into Buffalo?

A. I have, sir.

Q. What do you understand from his testimony to be his view of what the natural gas so imported is?

A. I regard his view as a representation of a scientific classification.

Q. What do you understand it to be—what is his classification?

A. He classifies it as a paraffine and as a bitumen and as a crude mineral.

Q. What do you understand this classification to be?

A. Scientific classification.

Q. What have you to say as to whether this classification in your opinion is correct or not, so far as it concerns paraffine?

A. I think that the article is in fact what has been known as olefiant, or marsh gas, and there is a long series of hydrocarbons, chemical compounds, consisting of carbon and hydrogen, and marsh gas is the first member of the series. The paraffine in the series is composed of twenty-seven atoms of carbon and fifty-six atoms of hydrogen, and between paraffine and marsh gas there must be twenty-five other hydrocarbons completing the series, and the series have taken the name of paraffine series, because paraffine is one distinctive point in the series, and it also has been called a marsh-gas series.

38 By Mr. ALEXANDER:

Q. Now, is this practically Dr. Vandenbergh's view also, as you gather it?

A. I think he would fully concur in that view from reading his presentation.

Q. Now, is there any point in Dr. Vandenbergh's evidence, so far as paraffine is concerned, in which you disagree with him?

A. Not in a scientific sense.

Q. Do you know what paraffine is, commercially considered?

A. I do know the substance that is sold as paraffine. I know the substance I would expect to get by giving an order for paraffine.

Q. What is it?

A. It is a hydrocarbon chemical compound.

Q. How is it obtained?

A. It is obtained by refrigeration from the distillate of petroleum or from Prince Albert coal or other bituminous coal when subjected to distillation.

Q. Could that which is known commercially as paraffine be drawn or in any way manufactured or obtained from natural gas or marsh gas?

A. Not in a practical way; possibly it could be produced by a very antique and circuitous scientific experiment or method.

Q. Do you recall any instance where there are similar differences between the appearance and uses of articles having the same chemical composition as exist in the case of marsh gas and paraffine?

A. I do not.

Q. What is the chemical formula for marsh gas?

A. CH_4.

Q. What is the formula for paraffine as you have just described it and known it commercially?

A. $C_{27}H_{56}$.

39 Q. Is paraffine considered, either chemically or commercially, a crude mineral?

A. Some of the paraffines are called crude minerals, mineralites, etc., but the paraffine that I have in mind, and I presume you are inquiring about, is an artificial product—is produced by distillation.

Q. Would not a product from marsh gas be recognized as a crude mineral?

A. I don't think of any known to my experience now.

By Col. WILKINSON:

Q. Doctor, is there any natural paraffine in the trade?

A. Ozocerite.

Q. Do you regard marsh gas as classified under the organic or inorganic species?

A. It belongs to the organic species.

By Mr. BISSELL:

Q. Could natural gas or this methane be regarded as a crude mineral in your judgment in any way?

A. It could in a scientific way.

Q. What would be your definition of a mineral?

A. I hold the definition given in Webster's Dictionary, quoted this morning, as an ample description of a mineral.

Q. Could not natural gas come under that definition?

A. No, sir; because natural gas is organic, and that description includes or describes the inorganic species.

Q. Now, just read that definition and see if natural gas could not be included in that?

(Witness reads the definition of a mineral as given in Webster's Dictionary.)

Q. Is bitumen a mineral?

A. According to Webster's definition it is.

40 Q. Do you know how natural gas is obtained from the earth—is it not obtained by mining?

A. I have seen it burning in Erie, Pa., coming through a pipe?

Q. You do not know how they get it?

A. I presume I know how.

Q. You have never seen them?

A. I have never seen them go through the whole operation of sinking a well.

Q. There is no change in the gas from the time it leaves the ground until it is burned, is there?

A. No, sir; it is a natural product.

Q. Just as much as coal?

A. Yes, sir.

Q. Or asphalt?

A. Yes, sir.

Q. Might it not properly be included under the general term bitumen scientifically?

A. It depends upon what value you attach to the word.

Q. It is a bituminous substance, is it not?

A. Yes, sir.

Q. Isn't a bituminous substance bitumen?

A. Yes, sir; I guess that is correct.

Q. Have you ever, Doctor, investigated the subject of natural gas in the United States census reports?

A. No, sir; only as I have seen them quoted in the testimony of Dr. Vandenburg.

Q. You don't know how natural gas is classified there?

A. It is classified scientifically, I know, as a mineral substance.

Q. If it were classified in the United States census reports scientifically and commercially as a mineral, would that influence your judgment as to its proper classification?

41 A. If I knew that, that commercial information was obtained from commercial sources, that would settle it with me.

Q. Natural gas has not been used very long, has it, in commerce?

A. I have known it to be an article of commerce only by hearsay.

Q. It is only recently that it has been used at all?

A. That is my understanding.

Q. And it has been imported only a few months—that is the first time you have heard of it in this case?

A. Yes, sir.

Q. I understand you to say that paraffine wax could be produced from natural gas, and by a difficult process perhaps a solid could be produced?

A. I presume it could be produced by a very circuitous operation, but have no knowledge that it has been done up to this time.

Q. The gas, as I understand you, could be included within the general term of a paraffine?

A. Yes, sir; it is one of the paraffine series of hydrocarbon.

EXHIBIT K.

Before the Board of U. S. General Appraisers. Special Hearing by Col. Wilkinson. In the matter of the protests of the Buffalo Natural Gas Fuel Company, 11216/23–B. New York, July 2, 1892. James A. Russell, stenographer.

42 ROBERT A. CHESEBROUGH, called as a witness, and being firs duly sworn, testified as follows:

By Mr. ALEXANDER:

Q. Where do you reside?

A. New York.

Q. What is your business?

A. I am president of the Chesebrough Manufacturing Company, manufacturers of vaseline and other petroleum products.

Q. And you have been engaged how long in such manufacture?

A. The manufacture of petroleum since 1858—well, I should say coal oil petroleum, because that was even before the days of petroleum. The manufacture of petroleum began in 1861; I was in coal oil before that date.

Q. Can you tell what are the mineral waxes known to commerce?

A. Those found naturally in the earth are known as ozocerite or natural wax.

Q. Now, would that be your full answer to that question? The question is, What are the mineral waxes known to commerce?

A. There is only one, sir; it has different qualities, as it exists in different parts of the earth; that which comes from Austria is different from that which is produced in America.

Q. What is the substance known commercially as paraffine?

A. The substance known as paraffine is a manufactured article made from petroleum by destructive distillation; it does not exist naturally in the crude oil, but is the product of the still and the condensation of vapors produced by distillation.

Q. Is paraffine, commercially known, obtained in any manner other than by the destructive distillation of petroleum or bituminous coal?

43 A. No, sir; it is not. If you take any of the crude oils with which I am familiar and subject them to an amount of cold or pressure, paraffine can not be obtained from them. It is well known (on this side of the Atlantic, at least), that the distillation of crude petroleum produces a change of structure in the distilled products, and it is this change which results in the formation of paraffine wax. It is impossible to produce paraffine from crude petroleum by the application of any degree of cold and pressure; but by chilling and pressing the heavy distillate of crude petroleum, paraffine may be obtained in abundance. The fact is, that paraffine is the product of the still, and does not exist naturally in the crude oil any more than whisky exists in corn or butter in milk. All three are manufactures, and result from chemical changes in the substances from which they are made. The English chemists, following the lead of Watts, still persist in viewing coal oil, crude petroleum,

as similar bodies, although the first is a distilled and the latter an original substance. The error arises from the fact that Watts and his followers obtained their results from oils made from coal, and naturally inferred that crude petroleum was its equivalent, because the distillation of the substance yielded equivalent results. Our American chemists follow their English brethern in classifying both as the "paraffine series," but it would seem to be desirable nomenclature which leads to error should be reformed. By distilling either the ozocerite or any of the petroleum or coal oils paraffine may be obtained in abundance.

By Col. WILKINSON:

Q. Is not the crude ozocerite a natural paraffine?

44 A. It has become known so in the books because it belongs to the natural series. If you would call ozocerite a natural paraffine you would call crude oil.

Q. Does not ozocerite enter into the trade without any further production?

A. No, sir; ozocerite is an amphorous product which is homogeneous throughout; paraffine is a defined crystal which has a structure quite different.

Q. There is no paraffine that you know of known in trade that is not a product of manufacture?

A. Of the still, certainly not; no. If it were proper to call anything except the commercially known paraffine by that title, it would certainly be proper to call all crude oils paraffine. As I understand the question here, it is whether natural gas is entitled to be considered as a paraffine. Well, no more so than you would consider crude oil paraffine. The crude oils are simply known as the paraffine series. I believe that is a misnomer which would never have arisen if, when the books were written, the difference between the two had been clearly understood as it is now. Natural gas, in my opinion, is the elementary substance from which the crude oil comes, and therefore it should be governed by the ruling which applies to an elementary condition, or to its equivalent condition.

By Mr. BISSELL:

Q. Is it a member of the paraffine series?

A. Yes, sir.

Q. Just as ozocerite is?

A. Yes, sir; just as naphtha is; just as any product of petroleum from which you can obtain no paraffine at all, and that simply arises from the book nomenclature. Now, the article which we know as paraffine, and which is admitted free of duty, is a specific article of merchandise used in manufacturing—a well-defined crystallized structure.

45 By Mr. ALEXANDER:

Q. Is ozocerite or any other natural wax known as paraffine; that is, of course, commercially in trade?

A. In a commercial sense it would belong to the paraffine series as taught to-day in the colleges.

Q. Is ozocerite or any other mineral wax ever known as paraffine; that is, of course, commercially in trade?

A. No, sir.

By Col. WILKINSON:

Q. What is ozocerite?

A. A crude mineral.

By Mr. BISSELL:

Q. It is known as a crude mineral?

A. As a crude mineral wax; mineral, I suppose, because it comes from the ground. I don't know of any other reason why it should be considered mineral.

Q. I understood you to say that natural gas belongs to the paraffine series the same way the ozocerite would?

A. The same way that ozocerite would, or crude mineral.

Q. Would natural gas be a mineral, in your opinion?

A. Yes; because it comes from the ground, either spontaneously or by wells—boring.

Q. How many kinds of paraffine are there that are commercially known?

A. Only one that I know of. There are different qualities of the same paraffine. We have a lower grade known as soft paraffine; then paraffine when it is pressed from the oil is crude, after that it is refined; but I don't think it is sold in the market except in its refined state.

Q. Do you import paraffine?

A. No, sir.

Q. You manufacture, do you?

46 A. We do not; no. That is a bi-product which we don't manufacture; we sell distillates containing paraffine.

Q. You are manufacturers of vaseline?

A. Yes, and kindred products; but we don't make the paraffine.

Q. You deal in it?

A. No, sir; we buy some for the manufacture of ointments; we don't make our paraffine; it don't pay us; we sell the distillates.

Q. How do you come to know so much about it?

A. Been at it for years.

Q. You don't manufacture it now?

A. Not at the present time.

Q. Deal in it?

A. Oh, for many years.

Q. How long have you known natural gas commercially and of its importation?

A. Never till yesterday.

Q. Never heard of the importation of it till yesterday?

A. No.

Q. Do you know where it is obtained?

A. Only from what one of the gentlemen present told me.

Q. Only from hearsay?

A. That is all.

Q. Have you ever investigated the subject of natural gas, in the books or by analysis, to know what it is?

A. I have read a good deal about natural gas; I think I know what it is.

Q. Have you investigated it in the census reports?

A. Not particularly; I have read something about it; I have not given the subject any very——

Q. Do you know a Professor Peckham?

A. No; I do not.

47 Q. You have never read his work on the subject, or his report?

A. Is that the report issued by the Government?

Q. Yes, sir.

A. I think I have looked over it; I should not remember his name as connected with it; I have not given it any close attention.

Q. You do not know how natural gas is classified in the census?

A. I do not; no.

By Mr. ALEXANDER:

Q. Have you a sample of the ozocerite?

A. (Produces a sample of white filtered ozocerite, which is made from the sucker rod wax coming from the Tiona crude district of Pennsylvania.) This sample shows clearly the difference between the ozocerite and paraffine; one is amorphous, the other well-defined crystals. This could not be used for the purposes that paraffine can, or vice versa; by no amount of chilling or pressing could paraffine crystals be obtained from this sample.

Q. Where is the Tiona district of which you speak?

A. It is north of Pittsburg, I think; about 100 miles north of Pittsburg.

(Sample offered in evidence, admitted, and marked "Government Exhibit 1," of this date.)

JACOB WALLACE, called as a witness and being duly sworn, testifies as follows:

By Mr. ALEXANDER:

Q. You reside in New York City?

A. Yes, sir.

Q. In what business are you engaged?

A. I am president of the Ozocerite Mining Company, also

48 vice-president of the United Oil Company of Colorado, and a manufacturer of wax paper and dealer in wax; that is my active business in New York.

Q. How long have you been engaged as a dealer in wax?

A. About ten years.

Q. Where is the ozocerite mines located?

A. They are located at Soldiers Summit and Pleasant Valley Junction, east of Salt Lake, on the Denver and Rio Grande Railroad.

Q. Are you engaged in the manufacture of what is known commercially as paraffine?

A. No, sir; we are not engaged at present, but we are about to put up a plant in our Colorado oil field. I will state at the outset that I was the discoverer and first promoter of this field in Colorado, and have developed it from its incipiency, and of course have a general idea of what oil is and what it contains.

Q. Have you ever been engaged in the manufacture or sale of paraffine?

A. Oh, yes, sir; continuously.

Q. For how long a time?

A. For ten years.

Q. Manufacturer?

A. No, sir; I have not been a manufacturer for ten years of it; *but* since 1885. I investigated these Colorado oils after opening the fields to see the result of the oil—what they would produce in paraffine. Petroleum varies from 26—from 25 even—natural gravity to 35 or 40. Of course, the lighter oils from Pennsylvania, and they carry paraffine in the amorphous state very slightly.

Q. Have you brought with you a sample of what is known commercially as paraffine?

A. Yes, sir [producing same].

(Same offered in evidence, admitted, and marked "Government Exhibit 2," of this date.)

49 The WITNESS. This is a sample of the lowest order of what I would term paraffine, the paraffine of commerce, inasmuch as my definition of the paraffine of commerce is a crystallized hydrocarbon, hydrocarbon crystal in other words; the paraffine of commerce is a solid substance that is produced by crystallization from the petroleums, and that is done by destructive distillation.

Q. Now let me ask you this question: How is Exhibit 2 produced?

A. Produced by destructive distillation.

Q. Just go on and give that—explain the method, if you will?

A. This, of course, is produced from the light oils. The eastern petroleum has a gravity of from 35 to 37 or 38; it is placed in a still under steam heat, the ordinary still worm, and the heat carries over the lighter products, carrying forward the naphtha, and after the naphtha passes you reach a 60 or 65 gravity, and that is carried over a point, say of 35, or 30 is probably carried over. That is known as petroleum distilled. The crystals, of course the paraffine is in its amorphous state in the body of the petroleum, but distilling it in this way the crystals, being in the heavier body, the lighter products are carried over and the crystals are separated; in other words, are left in the still. The lighter product carries the actually burning petroleum over and leaves it nominally as free as possible from any crystals. This is done to prevent a wick from clogging in a lamp, to make good burning lights. The remainder is condensed into a tar; it would vary in thickness from a soft-running tar to a pliant one. This is taken off and put into a still with direct fire heat under it. The first product of the eastern oil will probably range from 85 to 90 per cent of the petroleum, it being very light and carry-
50 ing very little of the crystals in it, probably three-fourths of three per cent; 85 to 90 would be carried over in the eliminating series. This last amount is put into a still under direct heat, steam not being powerful enough to decompose the matter, and carried up to over three or four hundred degrees, according as the heat is increased. The second product is forced over by direct heat; the first substance, of course, being more easily vaporized, you proceed to vaporize the remainder of this tar. The first carried over is known as light paraffine distilled, the second as medium paraffine distilled, the third as heavy paraffine distilled. The paraffine distilled, after being carried over the three grades are chilled; they are put under hydraulic pressure; the pressure under the first one brings out a soft wax, which is known as chewing-gum wax. An oil which is produced from the crystals is known as a neutral oil; it is almost a volatile matter.

By Col. WILKINSON:

Q. Is chewing gum made of paraffine?

A. The better grades of it, yes; but there is a gum in Mexico which is mixed with it, a tough gum; it is perfectly innocent to use; it is not at all injurious; very good, the dentists say; very good for the teeth; it is perfectly pure.

By Mr. ALEXANDER:

Q. It is white, is it not?

A. Yes, sir; this is bleached afterwards. The Colorado product is where my friend who went before me was mistaken about not being able to get paraffine without destructive distillation, because we can take the oil and squeeze the paraffine out of it without heat or anything. This second one produces the oils out of which headlight oils can be taken, and the next grade produces the harder gums, the last one the heav-
51 ier. The last product which comes out, which is the very lowest of the paraffine, is this substance right here; that is the lowest paraffine you can get [producing sample].

(Same offered in evidence, admitted, and marked "Government Exhibit 3," of this date.)

The WITNESS: The remainder is a carbon, out of which the carbon points used for electrical purposes are obtained.

By Col. WILKINSON:

Q. Where does the dead oil come in?

A. Why, I have just been distilling this tar all over for you; this is the very tar we speak of; it contains all these products, and it contains all the aniline colors—myriads and myriads of shades of aniline colors. One gentleman has recently produced ten thousand shades out of aniline dye before he could publish his work on it. The paraffine, in a commercial sense, is simply the crystal. The whole body contains it in an amorphous shape, but it is not paraffine of commerce in an amorphous shape. This material that Mr. Chesebrough stated could not be gotten out except by distillation, this sucker-rod wax he claims is a plain evidence, of course, that the wax is in there in an amorphous shape, but it is not marketable in that shape. The wax that he claims is ozocerite, as being wax in an amorphous shape, of course it is an amorphous substance, but it is of an entirely different character, for this simple reason, that nature has positively distilled that wax the same as science would distill paraffine.

By Mr. ALEXANDER:

Q. How does the product obtained from the pressure of crude oil, of which you speak, differ from the paraffine of commerce?

A. It is not a crystalline in form; it is not a crystal.

Q. Then the paraffine of commerce is always crystallized?

52 A. Yes, sir; it is a crystal.

Q. And you obtain it and you get it from its amorphous condition to its cry'talline condition through the process you have already described?

A. Through destructive distillation.

Q. And that is the only way it can be obtained?

A. Yes, sir; no, it is not destroyed; this ozocerite is not destroyed.
Q. What is this which I hand you a sample of?
A. This is a sample of refined paraffine.
(Same offered in evidence, admitted, and marked "Government Exhibit 4," of this date.)
Q. In what respect does Exhibit 4 differ from Exhibit 2?
A. Exhibit 4—the difference between Exhibit 4 and Exhibit 2 is that the crude paraffine carries certain proportions of oil, petroleum carries an odor of petroleum and a lower melting point; Exhibit 4 is the same thing exactly, only subjected to great pressure, so as to drive out the last remaining touch of odor taste of petroleum.
Q. Then Exhibit 4 is the refinement of Exhibit 2?
A. Exactly; if they were both melted they would look exactly alike, almost.
Q. In what respect does Exhibit 2 and Exhibit 4 differ from Exhibit 1?
A. Exhibit 1 is the amorphous paraffine as it is contained in all oils in an amorphous shape; it is in liquid form.
Q. Could Exhibit 1 properly be called commercially paraffine?
A. No, sir.

By Mr. BISSELL:

Q. Will you please state in what respect you differ with Mr. Chesebrough, in respect to the Exhibit 1?
53 A. Only in the name he gives it.
Q. What would you call it?
A. I call it amorphous paraffine.
Q. And he called it ozocerite?
A. Yes, sir.
Q. You say it is not ozocerite?
A. No, sir; it is not ozocerite.
Q. And you say there are other ways of obtaining paraffine than by the process of destructive distillation?
A. I did not; I said that you could obtain amorphous paraffine by simply pressing, but it would not be a crystal.
Q. The process of destructive distillation, then, is not the only way of obtaining paraffine?
A. It is the only way of obtaining the paraffine of commerce. We can get an amorphous paraffine, but it is not in the oil; all oils have more or less amorphous paraffine, but they are not commercial.
Q. Have you ever investigated, commercially, the subject of natural gas?
A. I have not, sir.
Q. Do you know of its importation in this country?
A. The first I heard of it was yesterday.
Q. You have never dealt in it in any way?
A. No, sir.
Q. Never have investigated it in the scientific books?
A. I have never investigated it very closely; I have—well, I cannot say that I have experimented with it, but I have classified it.
Q. What do you say as to whether or not it belongs to the paraffine series?

A. Now you are asking me an expert opinion. Of course we know that it varies. Generically speaking, we think at a certain point,
54 say ton, it belongs to the gaseous substances and petroleum oils, between that and paraffine; it is more different from paraffine than petroleum.

Q. It is more different from the paraffine of commerce than even petroleum?

A. Yes, sir; I have never known anything to condense a gas so as to get a paraffine crystal from it.

Q. You believe it could be done, don't you?

A. I would rather see it.

Q. You have never read the U. S. census reports on the subject of natural gas?

A. No, sir; I have not.

Q. Don't know how it is classified there?

A. No, sir; of course we know this, that of all lighter products in Colorado the naphtha—and that there is positively no way of getting any paraffine crystals out of that. Of course some of our wells—we burn gas for lighting purposes right from our wells.

Q. These samples that you have shown to the court here, do they comprise all of the paraffine known to commerce?

A. Well, they are of that class; of course they vary; this is not the highest melting point; the highest melting point we can get is 122 to 144, and this I brought is 130; probably the range of these paraffines is from 85, melting point, to 142—that is, commercially; when you get above that they get into—well, we have never been able to produce a melting point above that, while the amorphous paraffines have no melting points. In speaking of 130, I refer to Fahrenheit.

Q. Is paraffine known to commerce in a liquid as well as a solid form?

A. No, sir. Of course there is a class known as paraffine oils,
55 lubricating oils; the lowest grade of paraffine is, as I said, about 85 or 90, which is known as soap-makers' paraffine.

Q. You have produced here practically all the paraffine known to commerce?

A. From the range of still trailings, which is the residue.

By Mr. ALEXANDER:

Q. What is this sample which I show you?

A. This is a sample of crude ozocerite from Utah.

(Sample offered in evidence; admitted and marked "Government Exhibit 5," of this date.)

Q. Where is Exhibit 5 obtained and what is its nature, as far as you know?

A. It is obtained from Utah, at Soldiers Summit; it would be classified as a natural mineral wax; has a melting point, I think, of about 175, being above anything of foreign melting point; it is used for covering electric wires, for insulating wires; it is the greatest known substance for that purpose, highly valuable on account of its high melting point.

Q. Can paraffine be made from it?

A. Yes, sir.

Q. In the same way, by the same process, as already described?

A. No, sir.

Q. By what?

A. The process of making paraffine is, of course, by destructive distillation, but this carries the thing near the wax, but it carries also a quantity of asphalts. The whole series are here—all the stuff; all that has to be eliminated; it will yield from 45 to 50 per cent of paraffine when it is subjected to destructive distillation. The balance of it would be residue of the nature mentioned.

56 Q. I show you another sample; what is it and where is it found?

A. This was found in Boyslau, Galicia.

Q. What is it?

A. It is ozocerite.

(Same offered in evidence; admitted and marked "Government sample, Exhibit 6," of this date.)

The WITNESS: This Exhibit 6 is refined and carried into white without destructive distillation simply by decolorizing chemically.

Q. What is it that you cannot produce from this Exhibit 6?

(Objected to as immaterial. Objection sustained.)

Q. What is cerosine?

A. It is decolorized natural mineral wax.

Q. Obtained from what?

A. Obtained from decolorizing ozocerite. If you take Exhibits 5 and 6 and subject it to destructive distillation the result will be paraffine or it will be a crystal; simply decolorizing it without doing anything but just applying chemicals to take the coloring matter out, you have cerosine.

Q. Are these samples which I now hand you samples of cerosine?

A. Yes, sir.

(Same offered in evidence; admitted and marked "Government Exhibits 7 and 8," of this date.)

By Mr. BISSELL:

Q. There are eight samples upon this table here. Do we have eight samples here because they belong to the paraffine series? Do all these exhibits belong to the paraffine series?

A. Yes; certainly.

Q. How many of them are known to commerce as paraffine?

57 A. Two of them.

Q. What are their numbers?

A. Exhibits 2 and 4.

Q. And the rest are what?

A. Cerosines and ozocerites, natural mineral waxes; the rest are not products of destructive distillation.

Q. Are they imported into this country?

A. Yes, sir.

Q. Under what commercial designation are they imported into this country?

A. They are imported as natural mineral wax and cerosine.

Q. And as paraffine also?

A. No, sir; paraffine quantities have been imported from Scotland for years gone by; whenever the price used to go above a reasonable figure they would import it.

Q. There is none of it imported now?

A. There may be some of it imported now; I don't know at the present moment but what it is imported.

By Mr. ALEXANDER:

Q. Is there a series known to commerce as paraffine series?

A. Well, no, sir; the question that I was asked I supposed that everything was in the paraffine series.

By Mr. BISSELL:

Q. You dealers and experts refer to these different things as belonging to the paraffine series, don't you?

A. No, sir; as belonging to the wax series; we have Japan wax and Canae wax.

Q. You are not an analytical chemist?

A. No, sir.

HAYDEN M. BAKER, called as a witness and being first duly sworn, testifies as follows:

By Col. WILKINSON:

Q. Is naphtha one of the paraffine series chemically?

58 A. One kind of naphtha is; there is a coal-tar naphtha, and there is a petroleum naphtha. The petroleum naphtha belongs to the paraffine series, and not the coal-tar naphtha; that belongs to the aromatic series.

Q. What naphtha is it that is imported here that you have analyzed occasionally?

A. There is a very little of that comes; sometimes benzine, sometimes tolleule.

Q. Sometimes beta-naphthol?

A. Beta-napthol is not a naphtha; it is a fenol, belongs to the fenol series.

EXHIBIT L.

Before the Board of U. S. General Appraisers. In the matter of the protests of the Buffalo Natural Gas Fuel Co., 11216/23–B. New York, January 11, 1893.

Present: General Appraiser Wilkinson; Col. Alexander, for the collector; H. P. Bissell, esq., for the protestants; James A. Russell, stenographer.

EDWARD T. BEDFORD, called as a witness and being first duly sworn, testifies as follows:

By Mr. BISSELL:

Q. What is your business?

A. I am manager of the Thompson and Bedford department of the Standard Oil Company, of New York.

Q. What is the business of that concern?

A. The business is mineral lubricating oils and paraffine wax.

Q. Do you deal in any other paraffine products except the wax?

59 A. Yes, sir; we have paraffine oil, paraffine gas oil, and the different grades of paraffine wax, paraffine scale, paraffine semi-refined wax, paraffine refined wax.

Q. How long have you been engaged in that business?

A. About twenty-two years.

Q. How large a business do you do?

A. With these products?

Q. Yes, sir.

A. About eight million dollars a year.

Q. Are you familiar with the production of the paraffine wax?

A. I am.

Q. State how they are produced.

A. Paraffine—the whole paraffine family, do you mean?

Q. Yes, sir.

A. They are produced by distillation and residium of crude oil. The distillation forms the paraffine, or the scale, and that is usually, to some large per cent, pressed from the oil in bags, in the usual way of pressing, and then from that refined into paraffine wax?

Q. Well, you are familiar with the markets in this country which deal in these paraffine products?

A. I am, sir.

Q. You may state whether or not there is anything known to commerce which is dealt in as a commercial commodity under the name of paraffine?

A. No, sir; there is not.

Q. Could you fill an order if it were sent to you asking that you send paraffine?

A. I could not.

Q. What would you do in that case?

A. I would have to return the order and ascertain what paraffine product it meant.

Q. Whether it meant——

60 A. Wax or oil, or lubricating oil or gas oil, or what product it did mean. It is a prefix to a product.

Q. What is paraffine gas oil?

A. One of the products made in distillation—one of the series from which more solid products are produced, being the more fluid products.

Q. And what is that used for?

A. For making gas.

Q. Making gas?

A. Sold to gas companies.

By Col. ALEXANDER:

Q. Paraffine is a generic term, Mr. Bedford, is it?

A. Won't you define what you mean by the word, please?

Q. A general term, that includes a family of products?

A. Yes, sir.

Q. If the word paraffine was used in a law, what would it include; the single word paraffine or paraffines—all paraffines?

A. Paraffine to me; I cannot say what it would mean in the law.

Q. What would it mean to you commercially?

A. It would mean the whole series of paraffine products, to my mind, and I think it would to anybody dealing in it.

Q. Is paraffine always a manufactured product?

A. Yes, sir; I might modify that just a little. Paraffine is produced either by nature's distillation or by our method of distillation; it might be called, perhaps, mechanical distillation. Paraffines are caused by heat; the separation is made by heat. There are in some parts of the country paraffine found in all the conditions I have named—solid, fluid, and some fluid. Nature makes the distillation as we make it.

61 By Mr. BISSELL:

Q. Could it also be gaseous?

A. Certainly; that would be only one of the series.

Q. Are you familiar with the natural-gas fields?

A. No, sir; I am not.

Q. But as an expert, what do you think is the cause of the natural gas?

A. Why, it is nature's distillation.

Q. I understood you to say a minute ago that the paraffine are created by either natural or mechanical distillation.

A. Yes, sir.

Q. What do you mean by natural distillation?

A. I mean the heat of the ground down low where it is sufficiently hot to make a distillation, and that would throw off the gas and leave the more solid substance.

Q. This ozocerite is the product after the gases have been thrown off?

A. Yes, sir.

Q. A distillation by nature?

A. Yes, sir. Nature has done the work we do here.

Q. You are familiar with ozocerite, are you?

A. Oh, yes, sir; I have dealt in it; it is found in the Western country—Utah—in Germany, and in India.

Q. That, you say, was formed by a process of natural distillation?

A. Yes, sir.

Q. Through the heat?

A. Yes, sir.

Q. The gas having been thrown off?

A. Yes, sir; and that left as a residium.

By Col. ALEXANDER:

Q. What is the substance known commercially as paraffine?

A. There is no subject known commercially as paraffine.

62 Q. What is the substance known commercially as paraffine?

A. Well, there is none known just as paraffine.

Q. Is not a substance known commercially as paraffine a manufactured article made from petroleum by destructive distillation?

A. Paraffine wax is so produced.

Q. Is not the subject known commercially as paraffine?

A. Excuse me, sir, but there is no subject known as paraffine simply.

By Mr. BISSELL:

Q. I have selections from the Oil, Paint, and Drug Reporter, giving the advertisement of the Standard Oil Company, of New York, the

Thompson and Bedford Department; you are familiar with the trade advertisements of paraffine products, are you not?

A. I think I might say, gentlemen, that we market 75 per cent of all that is sold in the United States of the paraffine products or paraffine family.

Q. I wish you would look at these advertisements which are appended to this paper which I show you; look them through and tell the board whether or not there is any other paraffine product that has been sold or advertised besides those that are stated in those advertisements, and state what you find there.

A. This states paraffine oils and paraffine wax and paraffine candles; that is the advertisement of the Tidewater Oil Company. The advertisement of the Freedom Oil Works, of Freedom, Pennsylvania, is paraffine oils and paraffine wax; the advertisement of the Crew-Levick Company, of Philadelphia, they advertise paraffine wax, only; they do not make paraffine oils.

Q. Here is your own advertisement.

63 A. Our own refers simply to paraffine wax.

Q. You also had others advertised that appear later here?

A. Quite likely; I don't see it in this advertisement, however.

Q. That is taken from the New York Oil, Paint, and Drug Reporter?

A. Yes, sir.

Q. Of what date?

A. October 31, 1892; here are others—the Rocky Mountain Oil Company, Pueblo, Colo., they advertise paraffine oils, crude paraffine scale; Reed, Hall & Hewlett, of 20 Platt street, advertise paraffine oil. The Delaware Lubricating Oil Refinery, of Philadelphia, advertise paraffine oils and paraffine wax. In the Oil, Paint, and Drug Reporter's price list of October 31, 1892, there are paraffine oils of high viscosity, paraffine oils of 23½ to 24 gravity, paraffine oils of 28 gravity, paraffine oils of 30 gravity, paraffine oils of 32 gravity, and red paraffine oils number 1, red paraffine oils number 2; then they advertise paraffine crude wax, 125 melting point; refined paraffine wax, of 115 melting point; paraffine wax of 125, 130, 135, and 140; and then paraffine candles, fours, sixes, and twelves. Stevenson Bros. & Co., of Philadelphia, advertise paraffine wax. The drugs, oils, and paints columns of the Oil, Paint, and Drug Reporter quote paraffine wax, paraffine oils, and paraffine wax, crude and refined. The Oil, Paint, and Drug Reporter quote paraffine gas oil, paraffine wax, crude and refined.

Q. You do not find in those advertisements anything advertised simply as paraffine?

A. No, sir; there is no such thing.

Q. And you never saw that in any of the trade advertisements that you see?

64 A. Never.

Q. Do you ever advertise in that way yourself?

A. Never.

EXHIBIT M.

NATURAL GAS.

WASHINGTON, D. C., *May 12, 1893.*

Hearing before General Appraiser Wilkinson, of the Board of General Appraisers, New York City, held in the office of the Director of the United States Geological Survey, Washington, D. C.

Present: General Appraiser Wilkinson; Mr. E. B. Whitney, Assistant Attorney-General; Mr. C. E. Vrooman, Chief Clerk Office of the Solicitor of the Treasury, and Mr. Herbert P. Bissell, attorney, of Buffalo, N. Y.

Mr. W. F. HILLEBRAND, being affirmed, made the following statement:

By Mr. WHITNEY:

Q. Will you state your occupation, Mr. Hillebrand?

A. I am a chemist of the Geological Survey.

Q. How long have you been a chemist?

A. Since July, 1880.

Q. And have you been on the United States Geological Survey during that time?

A. I have.

Q. Where were you educated as a chemist?

A. In Heidelberg.

Q. How long ago was that?

A. I should supplement that by saying also at Strasburg and the mining school of Freiburg, in Saxony, between the years 1872 and 1878.

65 Q. And then you were engaged in professional work as a chemist from that time until 1880, when you came into the Government employ?

A. I was independently at work as an assayer in Leadville for one year, from 1879 to 1880, and then came upon the Geological Survey.

Q. The question here, Mr. Hillebrand, is whether or not the product known as natural gas is a mineral; will you give us what you consider the scientific definition of a mineral?

A. Even a scientific definition may admit of variations; the strict definition, I should say, the strict scientific definition which the mineralogist would use, is any inorganic substance having a definite chemical composition and usually possessing a definite geometrical form. The minerals, in the mineralogical sense of the word, are almost invariably solids; there are a few exceptions in which they may be liquid, as mercury and water. In this mineralogical definition of the sense of the word gasses are not included; there is a wider definition which, according to some authorities, or one authority at any rate, includes all the constituents of the earth's crust.

Q. And that you would consider to include gasses?

A. Yes.

Q. Which is the usual sense in which the word is used by scientific men?

A. By scientific men it is the narrower definition.

Q. Then the word "mineral," used as a noun, is not the equivalent, according to the ordinary use of the phrase, of "mineral substance?"

A. No; mineralogically it is not a synonym for "mineral substance."

Q. And does not mean anything that belongs to the mineral kingdom——

Mr. HERBERT P. BISSELL. I object to the leading of the wit-
66 ness. Let him tell it. He is a scientist, and if he will just state it briefly that will be the legal way to do it.

By Mr. WHITNEY:

Q. Is or is not the word "mineral," used as a noun, the equivalent of the phrase, "something belonging to the mineral kingdom?"

A. Do you mean in the general acceptance of the word, or in a more strictly scientific sense?

Q. I mean in the sense in which it is ordinarily used by scientific men.

A. In order to answer that question you must allow me to speak somewhat at length; it is a question that can not be answered in a few words. For instance, the miner uses the term "mineral" to indicate the substance that he is after, whether it is the valuable substance he seeks or whether he thinks it contains it. If he is after gold, silver, or lead, we will say—if, according to the indications which he has been taught to believe indicate the presence of that which he seeks, he comes across a piece of quartz or other rock, colored in a certain way or presenting a certain appearance which to his eye is a favorable indication of the presence of one of the metals he seeks, he calls it "mineral" irrespective of what it may be; and if he finds eventually that this substance contains none of these substances he throws it away, as it is rock or gangue. Now, the scientific men in a certain way acquire this habit. They speak of a vein as mineralized oftentime when it contains substances which may be of value in the arts and which it may pay to seek for, and oftentimes the scientific man speaks in general terms of minerals as comprising mixtures of substances; but if he wants to be precise he confines his use of the term "mineral" to a certain homogen'ous substance, a chemical entity, having a definite composition, just as the mineralogist does. I do not know whether or not I have answered the question.

67 By General Appraiser WILKINSON:

Q. Let me ask one question here. Will you please draw a distinction between a geologist and a mineralogist?

A. Formerly minerology included the subject of geology and mineralogy; geology was a part of mineralogy, but nowadays the subjects have been separated. The mineralogist, in the strictest sense, studies only those chemical entities, those substances which may or may not occur in geometrical figures that is crystallized, and a mineral in that sense has a perfectly definite chemical composition. The study of these substances—minerals, in the strict sense—is the duty of the mineralogist.

Q. Would you consider mineralogy a broader term than geology?

A. No; geology nowadays includes—implies to a certain extent a knowledge of mineralogy.

Q. But I thought you stated that mineralogy embraced geology?

A. No; not at present; but in the earlier stages of the science it embraced to a considerable extent the subject of mineralogy as well, but as the knowledge of these matters increased the sciences were differentiated; mineralogy was separated from geology, and geology is now, as I understand it, the broader subject.

Q. And what does that embrace?

A. I should prefer not to answer that question, as I am not a geologist myself. It embraces a study of the earth's crust, the rock formations, the manner in which the present contour of the earth has been brought about by the natural agencies, and it embraces also the study of the rocks, the sedementary and the eruptive rocks, and inasmuch as the study of these eruptive rocks requires a knowledge of mineralogy the geologist must be acquainted with mineralogy.

68 Q. Mineralogy is not limited particularly to the study of metallic minerals, is it?

A. If by metallic minerals you mean the minerals containing metal, like iron, copper, gold, no, certainly not; it embraces the study of all minerals occurring in the earth's crust.

Q. Do you call quartz a mineral?

A. Yes; most assuredly.

By Mr. BISSELL:

Q. You have examined, and I do not know but that you have made up, a good many of these reports on mineralogy in this department?

A. I do not understand you. To what reports do you refer?

Q. On the mineral resources of the country.

A. No; I have nothing whatever to do with that.

Q. What is your occupation, distinctly?

A. I am distinctly a chemist.

Q. Have you ever analyzed the substance known as natural gas?

A. I have not.

Q. Have you ever examined the reports here on the mineral resources of the country?

Q. Not in detail.

Q. You have not been a mineralogist for some time?

A. I have never been really a mineralogist; I have studied the subject in connection with chemistry. A thorough chemist must be something of a mineralogist; that is, one to be a good chemist must understand mineralogy; one who is working in a laboratory of this character must.

Q. Minerals, you stated, are solid and liquid?

A. According to most definitions, yes.

Q. They are also gaseous, are they not?

A. You will find some authorities to include them and others will exclude them.

69 Q. Whether or not a substance were a mineral would depend upon the composition of it, would it not, rather than upon form?

A. It depends. As I have said, in the strict acceptation of the definition of the term "mineral," it must have a definite chemical composition,

and this may be accompanied by a distinctive characteristic geometrical form, but not necessarily.

Q. That is not necessary?

A. Not necessary.

Q. It can be liquid, like quicksilver, for instance?

A. It can be.

Q. Any other liquids that you think of?

A. Water; that is generally classed among the minerals.

Q. And if gas were shown to have a mineral composition, that could also be properly classed as a mineral, scientifically, could it not?

A. According to some authorities; according to others not. May I quote a German authority on the subject?

Mr. BISSELL. I prefer to go into the United States authorities, but still if the court desires that we shall also go to the German——

General Appraiser WILKINSON. I suppose it will be necessary to produce the German authority, and not quote it from memory.

Mr. BISSELL:

Q. You have the German authority with you, have you?

A. I have it here.

Q. What authority is it—whose book?

A. Naumann-Zirkels' Elemente der Mineralogie, 12th edition, Leipzig, 1885.

Q. Is gas treated of in that book at all?

A. No; gases are not treated of there as minerals.

70 Q. Has natural gas, to your knowledge, ever been used in Germany?

A. I do not remember whether they find natural gas there or not; it had not been at the time I was studying there.

(The witness here read the translated definition as given in Naumann-Zirkels' Elemente der Mineralogie, as follows:)

"By the word 'mineral' is designated every homogeneous solid or liquid inorganic body which in the form in which it presents itself is an immediate product of nature, originated without the aid of organic processes and without human agency. The minerals form essentially the external crust of our planet, as this is comprised between the atmosphere and the unknown interior. As a matter of usage, however, some masses which have arisen from the decay and alteration of primordial organic bodies and are buried in the bowels of the earth, as, for instance, bituminous coal, lignite, amber, polishing slate, are included in the realm of the mineral kingdom, although they are really no minerals, but only fossils, a word which it was customary, especially in Germany, to use as synonymous with mineral. From the mineral kingdom are therefore excluded all gases and vapors which belong to the atmosphere." * * *

The WITNESS. I wish simply in citing this to give an instance of the difference of opinion that exists even among scientific men in regard to these definitions. Now, others will include gases in the mineral kingdom; in fact, I think it is generally done; but here is an exception.

Q. Then this definition that you have stated is an exception to the general definitions?

A. It is, so far as my personal knowledge goes.

71 Q. That is what we are asking. But the general definition would include gases—I understood you to say that just a moment ago—but there is some disagreement among mineralogists?

A. There is this—allow me to explain still further. We ordinarily speak of the vegetable kingdom, the animal kingdom, and the mineral kingdom—only those three. Now, if you exclude from the mineral kingdom the gases included in the atmosphere, you must set up some fourth class of substances; but I have never heard of such fourth class, and I do not know that any such is ordinarily designated, for certainly the constituents of the atmosphere are not vegetable, they are not animal, and ordinarily they are included in the mineral kingdom; I, myself, should include them there. I merely quote this as showing that authorities differ.

Q. Have you examined the analysis of this gas as it appears in the brief which I have here?

A. I have not examined it.

Q. You are familiar with methane?

A. Yes.

Q. If the analysis shows that this gas consists principally of methane—95 per cent at least of it—what is that?

A. Methane is the initial member of the series of the paraffine compounds.

Q. It is a member of the paraffine series?

A. It is a member of the paraffine series.

Q. Then, scientifically, natural gas, composed as it is of at least 95 per cent, would be a member of the paraffine series?

Mr. WHITNEY. I want to ask whether Mr. Hillebrand admits it to be 95 per cent.

Mr. BISSELL. He has not made an analysis of it—I asked him.

72 Mr. WHITNEY. I do not want him to be put on record as agreeing to this analysis.

Mr. BISSELL (referring to previous testimony). He says an analysis of the natural gas of Ohio shows here where there is about 93 per cent of methane, or marsh gas. Marsh gas and methane are the same, are they not?

The WITNESS. Yes, sir.

Q. Taking that analysis as if it were correct, natural gas would be a member of the paraffine series, would it not?

A. No, sir.

Q. Why not?

A. Because it is not pure.

Q. Would that be absolutely essential that it should be absolutely pure when nearly the entire percentage is of paraffine substance?

A. I should only say that the chief constituent—that methane, which is the chief constituent, is a member of the paraffine series; but inasmuch as it contains a number of other constituents which are not members of the paraffine series, and up to several per cent, natural gas itself can not be called a member of the paraffine series.

Q. These other substances, what are they? Will you read them there?

A. (Reading.) "The gas was found to contain methane, being marsh gas, 95.6 per cent; ethylene, propylene, and butylene, 1.6 per cent; car-

bon monoxide, 0.2; carbon dioxide, 0.6 per cent; hydrogen, 0.6 per cent; oxygen, 0.8 per cent, and nitrogen, 0.6 per cent."

Q. What are those various substances?

A. Ethylene, propylene, and butylene belong to the olefene series, and the others, carbon monoxide and carbon dioxide are oxides of carbon. Hydrogen, oxygen, and nitrogen are elementary gases.

73 Q. And they altogether amount to about how many per cent?

A. According to this analysis, adding them up, to 4.4 per cent.

Q. So that all but 4.4 per cent of natural gas is a member of the paraffine series?

A. Of the natural gas according to this analysis.

Q. Take paraffine wax, for instance, and analyze it. You would find some crudities about it, would you not; everything in it would not be a member of the paraffine series?

A. That I am not prepared to say. I do not know what the chemical composition of paraffine wax exactly is.

Q. Would you not describe this as a crude paraffine, or a member of the paraffine family, if it has some impurities?

A. Yes.

Q. Then it would be crude paraffine?

A. It is a crude gas.

Q. Yes; and if it is methane, with some small percentages mixed with it, then that would make it impure methane, and mithane is a member of the paraffine series?

A. Methane is a member of the paraffine series.

Q. And is scientifically a paraffine?

A. It is scientifically a paraffine.

Q. So this would be a crude paraffine, having these small impurities; is not that true?

A. I am hardly prepared to answer that question in the affirmative. I think in a sense, yes, it might be called a crude paraffine; that is, applying the term "paraffine" to the whole series of hydrocarbons having that general chemical composition, and not to the commercial substance which is ordinarily called paraffine, the solid.

74 Q. Do you know of any commercial substance that is called "paraffine" alone?

A. I do.

Q. What is it?

A. It is a mixture of various hydrocarbons of the paraffine series.

Q. What does it look like?

A. It is white in its pure appearance; somewhat waxy.

Q. Is not the commercial name for that "paraffine wax?"

A. It is possibly so. We in chemistry call it "paraffine."

Q. Have you examined the trade reports?

A. No, sir.

Q. The trade advertisements?

A. No, sir.

Q. You do not know how it is designated in trade?

A. I do not.

Q. You do not know how natural gas is designated commercially, do you?

A. Not by any study of the subject; no.

Q. You have not examined these various reports on our mineral resources that we have here, and that are issued by the Government?

A. I have examined certain ones, but, as I have said before, not in detail.

Q. How do you find gas classified in those?

A. I can not tell you; I do not recollect.

Q. You do not remember?

A No.

Q. You do not know whether it is classified among the minerals or not?

A. I do not recollect.

Q. Would that affect your judgment any if you found it was so classified?

75 A. It would not affect my opinion at all; no.

Q. Does the chemical composition affect your opinion; that is, as to whether it is mineral or not?

A. Yes; that is, it might, applying the strict definition of minerals.

Q. Is methane mineral?

A. It is mineral if you admit that gases can be minerals—that a gas can be a mineral. Some authorities admit that it can; others that it can not. I am myself not prejudiced in favor of one or the other view.

Q. But there are authorities which say that it is mineral, are there?

A. I understand so; I believe so.

Q. You do not recall them now?

A. I can not give specific instances at present; no. I could look up authorities and find them, perhaps, but I can not give them from memory.

Q. And you have not examined any of the works on the subject, so as to know whether or not, commercially, natural gas is designated among the minerals—classified among the minerals?

A. I have not looked the subject up at all.

By Mr. WHITNEY:

Q. Mr. Hillebrand, you have spoken of certain gases as belonging to the paraffine series, and have also spoken of some substance known as "paraffine." When you spoke of the paraffine series, did you, or did you not, refer to this substance called "paraffine?"

A. No; when I spoke of the paraffine series I included all members having the general composition of what is called the paraffine series; that is, carbon and hydrogen in certain proportions; for a definite number of carbon atoms there will be twice as many plus two atoms of hydrogen.

76 Q. Is or is not methane the same thing as the article sold in the stores as paraffine?

A. It is not.

Mr. BISSELL. I ask that that be stricken out. He does not know that what is sold in stores is paraffine. I can prove that there is something in trade known as paraffine.

By General Appraiser WILKINSON:

Q. Did you ever buy any paraffine in the stores?

A. I have not personally purchased it in stores; I have ordered it for the laboratory, to the best of my belief and recollection.

Q. By what name?
A. Paraffine.
Q. And what did you get when you sent the order?
A. The white solid—what is ordinarily known in chemistry as paraffine.

By Mr. WHITNEY:

Q. Did you get methane, or anything like methane?
A. No, sir.

By Mr. BISSELL:

Q. You got paraffine wax, did you?
A. I presume that is what you call it.
Q. Paraffine candles are made of wax, are they not?
A. Yes, sir.

By Mr. WHITNEY:

Q. They are made of paraffine, are they not?
A. I think so.
Q. Did you ever hear this phrase used—"paraffine?"
A. Yes, sir.
Q. And they are used synonymously for the same article—paraffine and paraffine wax?
A. In trade, to the best of my belief, they are. I will not venture the positive assertion. It may be that in trade paraffine and paraffine wax are the same, but I have never examined the matter.

77 By Mr. BISSELL:

Q. You have never examined the trade reports on that subject?
A. I have not; my chemical work has not been in that line?

By Mr. WHITNEY:

Q. I want to call attention—I suppose I can do it on the record—to the Century Dictionary definition of paraffine. It is: "The collective name for compounds of the marsh gas series which have the general formula C_nH_{2n+2}—that is, two more than twice as many hydrogen atoms as carbon atoms. These bodies are characterized by a remarkable chemical indifference; they are saturated hydrocarbons, all the atoms in the molecule being joined by single bonds, and therefore they can not enter into combination without partial destruction of the formula. (2) Specifically in commerce and manufacturing, a substance obtained in the dry distillation of wood, bituminous coal, wax, etc." (Page 4275, Century Dictionary.)

By Mr. BISSELL. That part of the definition would include natural gas, would it not?

The WITNESS. It would include methane.

Q. And I have shown you that natural gas is composed principally of methane?
A. According to that analysis.
Q. Assuming that that is correct—of course it may be wrong——

By Mr. WHITNEY:

Q. I want to ask whether scientifically the definition of mineral would be the same in German as in English—that is, whether it is a scientific

term that has the same meaning among scientists in the German and English language?

A. In mineralogy, yes.

Q. And I understand that you have here a book by a German mineralogist containing a German definition of mineral?

78 A. Yes.

Q. As a scientific man, in ascertaining the definition of mineral, would you apply to a German as equally as to an English source?

A. In a strict sense, yes.

Q. Then the English language contains no definition that is wider than any mineralogical definition known in the German language?

A. I have not consulted German dictionaries as to the various definitions that the word "mineral" may be subject to in German; I can not answer that question precisely.

Q. But as to the scientific sense of the word, you would apply to a German as quickly as to an English author?

A. I would.

Q. Is the German work that you have here a work of authority?

A. It is.

M. Will you, then, please give us again from the German work the name of the author, the date of publication, and the definition of "mineral."

A. Dr. Naumann-Zirkels' Elemente der Mineralogie; Leipzig, 1885. (Reading) "By the word 'mineral' is designated every homogeneous solid or liquid inorganic body which in the form in which it presents itself is an immediate product of nature, originated without the aid of organic processes and without human agency."

Q. Have you collected any English definitions?

A. I have looked up one or two authorities; yes.

Q. Is there any scientific dictionary of greater authority on such subjects than the Century Dictionary?

A. I do not know of any.

Q. Are there any scientific dictionaries that you have access to?

A. There is—Watts' Dictionary of Chemistry.

79 Q. Is that a standard work?

A. It is an English work, and has long been standard.

Q. Can you give us the definition from that book?

A. I took it down in part yesterday, or this morning; but if you prefer to have the original source I will bring it.

Mr. Hillebrand subsequently furnished the following as being the definition of "mineral," given in Watts' Dictionary of Chemistry, Vol. III, page 1025 (1882):

"Mineral. This term in its widest sense denotes any substance not formed by the processes of organic life; in its more restricted and more usual sense, it signifies any homogeneous solid or liquid inorganic body, formed by natural processes without the concurrence of art. Minerals understood in this sense constitute the essential part of the earth's crust. It is usual, however, to include under the same general denomination several substances which are evidently the remains of organized beings, chiefly vegetables, which lived upon the earth in former ages, e. g. coal, lignite, amber, and the several varieties of fossil resins and bitumens.

Such bodies should perhaps in strictness be called fossils, but they are more usually classed with minerals, and described as such in works on mineralogy."

By Mr. BISSELL:

Q. Will you please state, Mr. Hillebrand, if natural gas is treated of at all in that German work which you have quoted from?

A. I cannot tell you that without an examination of the table of contents.

Q. Will you kindly make such an examination?

A. I find nothing with reference to it.

Q. You studied in Germany?

A. I did.

Q. How long ago?

80 A. Between the years 1872 and 1878.

Q. Did you at that time ever analyze natural gas?

A. Not natural gas.

Q. Did you know of its being found there?

A. No.

Q. Would you not say that an American authority on a substance known principally or only here would be superior to a German authority, with regard to natural gas, for instance?

A. With regard to its properties, its chemical behavior, etc., possibly; with regard to its classification, no.

Q. Supposing it is not found in Germany?

A. If by the public prints its properties have become known, world known, I should say that a German was just as well qualified to discuss that subject, or to pronounce an opinion upon it, as an American.

Q. So would any intelligent scientist, I suppose, even if he was a Japanese or a Chinaman?

A. Yes, sir.

Q. But natural gas has been treated of principally in American books, has it not?

A. I believe so.

Q. It is not used as a fuel anywhere except in America, is it?

A. That I am not prepared to say.

Q. That you do not know?

A. I do not know.

Q. It is used here more than anywhere else in the world?

A. Yes, sir.

Q. I have a lot of good American authorities, and those would influence your judgment as a scientist, would they not, in respect to whether the substance is or is not a mineral?

A. Yes, sir; but a classification by American writers would not influence my judgment.

81 Major JOHN W. POWELL, Director of the U. S. Geological Survey, was sworn and examined as follows:

By Mr. WHITNEY:

Q. Major Powell, will you state your present occupation?

A. I am the Director of the Geological Survey.

Q. Of the United States?

A. Yes, sir.

Q. How long have you been the Director of the Survey?

A. Under its present organization, about twelve years.

Q. And how long have you been connected with the Survey of the United States?

A. About 23 years—not quite 24 years.

Q. Is it a part of your profession to be familiar with the science of mineralogy?

A. Somewhat; yes.

Q. So that you are familiar with the use of the mineralogical terms as ordinarily used by scientific men?

A. Somewhat so; yes, sir.

Q. Will you inform me whether or not the word "mineral," as ordinarily used by scientific men, would apply to a gas?

A. That would depend upon the nature of the gas. The question whether a mineral was a gas or not depends upon the conditions in which it is placed. A mineral may assume gaseous, fluid, or solid form under varying conditions.

Q. I am now using the word "mineral." I am not asking whether or not a mineral can be turned into the form of a gas, but whether a gas in the form of a gas would or would not, according to the usual use of language, be called a mineral.

82 A. Very few scholars would speak of a gas—that is, a gas at ordinary temperature at the surface of the earth—they would usually not speak of it as a mineral, but as belonging to the mineral kingdom. The ordinary method of using the term "mineral" is to use a term for that which is a solid; still, I do not think that that would be exclusively so. Many scientific men would use the term "mineral" even for a gas, as they do for water. Water in a solid state is a crystal and mineral; in a fluid state is still a mineral, and in a vaporous state is still a mineral; the question being the conditions under which it is put—whether it assumes a solid, fluid, or gaseous state.

Q. Then, as I understand you, Major Powell, there are two scientific uses of the word "mineral," of which you would consider the one which excludes the ordinary articles that are gases at the ordinary temperature as the more usual of the two?

A. I should consider it the more usual.

By Mr. BISSELL:

Q. You have charge of these reports, have you not?

A. I have.

Q. And gas is included in these reports as minerals?

A. Not among the minerals, but among the geological products.

Q. Well, in the reports of the mineralogical resources of the United States it is treated, is it not?

A. I have rendered a decision in selecting the articles which we should put in there. The name of the book was given to it before the selection of the minerals of which it treats was decided. When that was decided, I decided the question in this way: They wanted me to include the production of ice, because it was a mineral. I said no; the law provides

that we should investigate those minerals which are reached by geological agencies, and I included in that volume geological products,
83 left out many mineral products, and included many other things which I did not consider mineral products.

Q. You would consider gas, if it were mineral in its composition, a mineral, would you not?

A. Yes, sir.

Q. It would not depend upon the form—whether it was a solid or not?

A. Not with me. My definition of a mineral would be this, that that is a mineral which is derived from the inorganic kingdom; that that which is an organic body, not a mineral, but an organic body, is derived from the organic world.

Q. Are you familiar with methane as a mineral?

A. I am not particularly familiar with it; I know of it, but I am not familiar with it.

Q. You are familiar with the statistical abstracts that are issued here, are you not? Do those come under your eye?

A. Yes, sir; I am somewhat familiar with them.

Q. I find that in one of these statistical abstracts natural gas is treated specifically as a nonmetallic mineral. It is treated that way specifically and commercially, and that you would regard as a proper classification.

A. I should not think I made a strict classification.

Q. Supposing it were of mineral composition?

A. If I knew it to have been derived from the mineral or inorganic world, I would say it was a proper classification.

Q. That could be determined by analysis, could it not?

A. Yes, sir. As I understand it, rock gas, mineral gas, as it is sometimes called—that is, the burning gas—is derived geologically from the depths of the earth. I understand that to be derived from organic sources, and not to be a true mineral.

84 Q. But it is called mineral gas sometimes and rock gas sometimes.

A. Yes, sir. The theory of the origin of mineral, that at one time it was a pure rock gas, that it was a mineral, in modern investigation has been overthrown, and I believe among chemists and geologists it is universally believed, so far as I know, to have been derived from organic sources, from life.

Q. Take this natural gas we are getting from Canada, for instance. If that were shown to be natural gas from mineral, you would regard it as a mineral, would you not—mineral in composition?

A. Certainly; if it were shown by chemical analysis to have been derived from the inorganic world I should so consider it; but, as I understand it, no chemical analysis has done that or can.

By General Appraiser WILKINSON:

Q. Do you regard coal as a mineral?

A. Coal is one of those curiously doubtful matters that stands on the border line and forever remains in dispute. Coal is quite different from gas in that respect, the difference being this, that the chemical constitution of the gas is exceedingly complex, like that of protoplasm nearly; for example, like organic bodies and olive oils. Oils derived from the vege-

table world are enormously complex, while coal is not enormously complex; it is somewhat complex and stands very near the border line; it is partly one and partly the other.

Q. Are not both coal and limestone of organic origin?

A. I think that is taking me into a theoretical field very quickly indeed. In my own judment, all carbonate of lime was primarily derived from the inorganic world, but that much of it has been used in the organic world and returned to the inorganic world; while gas
85 and oil—rock oil and rock gas, as it is sometimes called—is derived exclusively from the organic world.

By Mr. VROOMAN:

Q. How do you classify petroleum or regard it?

A. I should classify it as an organic substance?

By Mr. BISSELL:

Q. Do you treat of that in these works on the mineral resources among the minerals?

A. In that book we do not go into any theoretical matter; we do not classify or treat of any theoretical subjects in that book. It is not intended for scholars or scientific men, but to give the people the best knowledge we can.

Q. You treat natural gas in that book as mineral, do you not?

A. Yes; among the substances.

Q. Among the mineral substances?

A. No; I would not say that.

Q. Under the heading "Minerals" you treat it, do you not?

A. No, sir.

Q. Under the head "Mineral resources?"

A. We treat it under the head of "Geological resources." This is a geological survey.

Q. If I mistake not, the work shows for itself—Mineral Resources of the United States?

A. Yes, sir; the name of the book was adopted before the question was decided what subjects we should take up. The law demanded, required, that we should take geological substances, and not mineral, and I included some mineral substances and some that I considered not mineral substances. That was the decision I rendered at the time.

Q. Do you know how natural gas is obtained?

A. Somewhat. Do you mean how it is gotten up from the earth?
86 Q. Yes, sir. It is by a boring or process of mining, generally, is it not?

A. Yes, sir; sometimes it escapes without boring.

Q. It is obtained as minerals are?

A. As some minerals are; not all.

Q. Would that influence your judgment at all in determining its classification?

A. It would not.

Q. The composition would, though?

A. Yes, sir; the composition would be my criterion. Many mineral substances are not derived geologically, as ice, for example.

Q. They mine especially for natural gas, do they not?

A. I would hardly say "mine;" they bore for it; they drill for it; you can hardly say "mine" for it.

Q. Would a recent decision of a court of law that natural gas is a mineral affect your judgment?

Mr. WHITNEY. I object to that question. I think it is a little outside of science.

Mr. BISSELL. Major Powell is talking about classification generally, and not as a chemist.

General Appraiser WILKINSON. I do not think that question is necessary.

Mr. BISSELL. I do not suppose exceptions are of any value; we do not appeal to any place that I know of. As he is a gentleman who is at the head of a large Department like this, and whose books include natural gas among the minerals, and as I have found a decision of a court of law, I wanted to know, if in making his classification, if it would affect his judgment that a court, that the common law, had placed it among the minerals—if that would affect his judgment as to classification.

87 Mr. WHITNEY. I understand that question is ruled out.

Mr. BISSELL. You do not object to it then, and it is ruled out?

Mr. WHITNEY. Yes, sir.

By Mr. WHITNEY:

Q. Major, I did not quite understand you. Did you testify that gas is composed of mineral substances or has a mineral origin? I do not understand your use of the term.

A. I think the popular use of the word would not include it as a mineral, but the strict scientific sense would include a gas derived from inorganic sources as a mineral.

Q. Suppose it appeared that there are two scientific definitions in use that are recognized in books, one of which includes gases and all mineral substances among minerals, and the other does not include gases. Which of the two is, in your opinion, the usual definition as the word is used among scientists?

Mr. BISSELL. I object to that question.

Mr. WHITNEY. We have proved that there are two definitions and I want to know which is the usual one among scientific men. Would they ordinarily say that air is a mineral or that air is a substance belonging to the mineral kingdom?

Major POWELL. A. My judgment is that ordinarily they would not speak of air as a mineral, but may under other circumstances; but common usage would not speak of a gas as a mineral; but if they were trying to define correctly a mineral I think they would be compelled then to bring in a gas derived from mineral sources as a gas. The illustration which I gave relating to water and ice, water and vapor, is a good one.

88 By Mr. WHITNEY:

Q. The latter definition that you spoke of—oxygen—would be a mineral, I suppose?

A. Oxygen would be a mineral.

Mr. GEORGE H. ELDRIDGE, geologist, was called by General Appraiser Wilkinson, sworn, and examined as follows:

By Mr. WHITNEY:

Q. Mr. Eldridge, will you state your present occupation and how long you have been in it?

A. I am a geologist on the United States Geological Survey. I have been on the Geological Survey since the first of July, 1884.

Q. What scientific education have you received?

A. I graduated from Harvard.

Q. In what year?

A. In 1876, having taken the geological and the allied courses there, and since that time I have been constantly in the field in geological and mining work.

Q. I suppose you have some familiarity with these different definitions of the word "mineral" that we have been listening to?

A. I know what you have been talking about.

Q. What is your definition of the word "mineral?"

A. I should say I think it is impossible to give a definition that would hold.

Q. I will ask whether or not you mean by that answer that there are different uses of the word and that it has no fixed use?

A. Yes, sir; that is just about what I mean.

Q. And that some scientific men understand one thing and some another?

A. Yes; I even think that.

89 Q. In the more usual sense of the word as used by scientists, would you or not think that a gas was included as a mineral?

A. I should think it was.

Mr. BISSELL:

Q. You include natural gas among the minerals?

A. I should; yes, sir.

Mr. WHITNEY. Or any gas of mineral origin—I mean any other inorganic gas?

Mr. BISSELL. Well, you assume that it is an inorganic gas?

The WITNESS. Among minerals I should include it, but not necessarily among natural minerals as distinguished from artificial minerals.

Mr. WHITNEY. But anything not artificial inorganic gas you would regard as a mineral?

A. Yes, sir.

Mr. BISSELL. Mr. Eldridge, you have made investigations of natural gas in this country, have you, in the course of your work?

A. Only casually.

Q. You have visited the gas fields of Pennsylvania?

A. Not in Pennsylvania; no, sir.

Q. Of Canada?

A. Nor of the East. I have simply been through them. I have not visited them to inspect them at all; but I am more or less familiar with their occurrence, and am acquainted with their methods, and have seen the gas fields West.

Q. Gas has been treated of comparatively recently, has it not, by the mineralogists—what we call natural gas?

A. It is a comparatively recent discovery and use; yes.

90 Q. And it has been used comparatively a short time in manufacturing, etc.?

A. Yes, sir.

Q. In these works that I find among the Government archives, natural gas is treated among the minerals. Is that due to the fact that it is a mineral?

Mr. WHITNEY. I object to that, unless you prove by the witness that he knows how the report was made up and who put it in, etc.

Mr. BISSELL. You are engaged in the U. S. Geological Survey, are you not?

A. Yes, sir.

Q. And are familiar with its work? I refer to this department where natural gas is included among the mineral resources of the United States.

A. I am not in the division of the Geological Survey which gets up these mineral resources. I am in another division of the Geological Survey. But I am familiar with the way in which they get up their mineral resources.

Q. A mineral is of three kinds, is it—solid, liquid, and gaseous?

A. It may be; yes, sir.

Q. Depending upon its composition?

A. No, sir; not depending on its composition; depending upon its physical condition—physical state—its surrounding state. By that I mean this: That you may take a gas, and under great pressure and great cold, you can compress that gas to a solid.

Q. You could do that?

A. Yes; a liquid I should say, and even to a solid.

Q. You could do that with this natural gas that is found in Pennsylvania, say?

A. That I do not know.

Q. Could you tell if you knew its analysis?

91 A. No; I could not.

Q. If you knew that it was composed principally of methane, for instance?

A. That I could not say. I do not know of any experiments which have been made.

Q. That is, you have not devoted your attention to chemistry?

A. Not to the chemical side of it; no, sir; only in so far as it is required in geological work, and in the ordinary mining work which we have to do; but when it comes to the chemical side of it, I have not devoted myself to the chemistry of it.

Q. You know how this gas is obtained—it is obtained by mining processes, is it not?

A. I should say so—processes that come under mining.

Q. And if it is not changed by manufacture in any way, and it were a mineral, it would be known as a crude mineral, would it not?

A. Yes, sir.

Q. So that in your judgment this natural gas could be properly classified as a crude mineral, could it not?

A. I should think it could be.

Mr. WHITNEY:

Q. I should like to ask whether there are scientific definitions of the term which would not include any gas as a mineral, but would leave them under the general head of substances belonging to the mineral kingdom. Let me ask whether there is any scientific definition of mineral which would exclude all gases, as distinguished from the phrase, "mineral substance?"

A. I should say there was no distinct definition of a mineral as a term, a "mineral," which would exclude all gases.

Q. You do not know of any?

A. I do not know of any; no, sir.

92 Q. Should you regard that in the ordinary meaning of the phrase, "a mineral," such a gas as oxygen, for instance, was included?

A. I should think so; yes, sir.

Q. When you say that natural gas is obtained by mining for it, do you mean any more than that they bore for it?

A. No, sir.

Q. Is it any more mining than the sinking of a well to get water?

A. No, sir; it is no more mining than the sinking of a well to get water, excepting in this way—that it is more nearly the sinking of a well for artesian water. The process itself requires, as in the case of artesian water, a knowledge of the strata through which you are to go, and it requires a much more extended knowledge of the underlying strata, and the condition of mining, or of boring, which we meet in this case amounts to the same thing as the ordinary sinking of a well which I took you to mean—the ordinary surface wells which we have.

Q. Within the meaning, definition, that you use, you would also say you mine for water when you sink an artesian well?

A. Yes; the usual term is to bore for either of those cases; but they are both mining operations.

Mr. BISSELL:

Q. They are both mining operations?

A. I should say so; yes, sir.

Mr. WHITNEY:

Q. I should like to ask whether digging a rifle pit is not a mining operation, too?

A. Not a rifle pit.

Q. How about exhuming a corpse?

A. Nor that.

Mr. BISSELL. That is excavation.

93 Mr. VROOMAN:

Q. I want to ask, are you familiar with petroleum?

A. Quite so.

Q. How do you regard it?

A. I have always called it a mineral.

Q. Are natural gas and petroleum derived from the same causes?

A. Practically; yes, sir.

Exhibit N.

In accordance with the foregoing stipulation, the following citations are submitted as supplementary and corroborative evidence:

The first reference to which attention is called is the report of Professor S. F. Peckham, special agent in charge of the technology of petroleum and its products to the 10th United States Census, published in 1886. The following are copious abstracts from Professor Peckham's report, and are given especially for the purpose of illustrating the generic use of the term bitumen. In common with paraffine and mineral the word bitumen is here used, as in all words of the kind, as a generic term.

Page 3.

"Petroleum is one of the forms of bitu*em* and cannot be discussed historically except in connection with the other forms. These are: Solids—asphaltum; semifluid—maltha; fluid—petroleum; volatile—naphtha; gaseous—natural gas.

"The word maltha appears to have been used by the Persians, and its equivalent, naphtha, has been frequently used in European literature to designate what is now called petroleum, and not the most volatile form of fluid bitumen occurring in nature."

94 "Solid bitumens to be designated from coal by the action of various solvents, especially benzole and carbon disulphate, which dissolves asphaltum, but have no action upon coal."

In discussing some of the early deposits of bitumen Professor Peckham states:

"This river—the Euphrates—brings down with its waters many lumps of bitumen, from whence the bitumen used in the wall of Babylon was brought. (Herodotus; 1, 179; J. S. A. vol. 639, 640)."

"Strabo mentions the occurrence of bitumen in the valley of Judea, and describes the commerce carried on in this article by the Arab Nabathenes with the Egyptians for the purpose of embalming." (P. 4.)

"This bitumen, with that from the spring of Hit, on the Euphrates, which served to cement the bricks of Babylon, is also used for coating ships and is still used in our own time for coating boats on the Euphrates."

"The semifluid bitumens was used in the construction of Ninevah and Babylon to cement bricks and slabs used in the palaces and temples. It was also used to render cisterns and silos for the preservation of grain water tight."

"The naphtha is more highly valued than the solid bitumen the most fluid varieties being used in lamps." (P. 4.)

In section 2 of this compendious report, Professor Peckham reviews the history of bitumen from the year 1800 to 1850: In beginning he states:

"In Europe early in the present century, chemists examine the bitumen of the Val de Travers. The gas springs of Romania again attracted attention, and the asphalt deposits of Albania, mentioned by Strabo and Pliny, were again described by Pongeeville. In 1811, Dr. Nich-

95 olas Nugent visited the West Indies, and on his return to England wrote an account of the famous Pitch Lake of Trinidad. He

described its lake of solid yet plastic bitumen on which were pools of water containing fish, etc."

"From 1820 to 1830 remarkable activity was manifested in the investigations of the nature and occurrence of bituminous substances." (P. 5.)

"The Honorable George Knox read a communication to the Royal Society of Great Britain, in which he noticed the wide distribution of these substances in nature, and the fact that even so-called eruptive rocks were rarely found entirely destitute of bitumen as an ingredient. This paper attracted considerable attention. In 1824 Reichenbach discovered paraffine in the products of the destructive distillation of wood, and in the following year Gay-Lussac analyzed it. Boussingault investigated the bitumen of Peckelbronn, on the lower Rhine, and compared its peculiarities with those of bitumens from other localities. These researches created a lively interest in France, and led to such experimenting upon both solid and liquid bitumens with a view to ascertaining the purposes to which they might be applied. During this period the first well was bored in the United States that produced petroleum in any considerable quantity." (P. 6.)

"During the decade 1830 to 1840 the attention of the most distinguished French chemists was directed to the investigation of bitumen. Boussingault continued his memorable researches, and in 1837 published a classical paper on the subject. Violet d'Oust propounded the first theory regarding the origin of bitumen in 1834, and the asphalt of the Dead Sea of Pyrmount and near Havana, Cuba, were examined. Hess wrote on the products of dry distillation and was reviewed by Reichenbach, who, with Laurient, continued his researches upon paraffine.

96 In 1833, Professor Benjamin Silliman, sr., contributed an article to the American Journals of Science, in which he described the celebrated oil spring of the Seneca Indians, near Cuba, N. Y."

"The decade from 1840 to 1850 was remarkable for the number of travelers, who, in different parts of the world, noticed the occurrence of bitumen, and also for several elaborate researches upon the geological occurrences and chemical constitutions of its different varieties. Travelers visited the far East, and even China, and gave glorious descriptions of the naphtha springs of Persia, the fire worshippers of Baku, and the fire wells of China."

"In our own country, Percival, in Connecticut, and Beck, in New York, called attention to the fact that bitumen was of frequent occurrence in Connecticut, New York, and New Jersey."

Page 19 of the same report contains the following:

"Chapter II: The geographical distribution of petroleum and other forms of bitumen.

"Section 1. The occurrence of bitumen in the United States."

"The following chapter has been carefully prepared for the purpose of showing the localities upon the earth surface at which bitumen occurs."

"The map of the world (I) has been prepared to show the location of the areas producing bitumen.

"The map of the United States (II) shows the localities within the United States that have produced bitumen of any kind.

"The large map (II) shows the areas in Pennsylvania and in New York that have proved commercially valuable."

"Map IV represents in a general manner the localities in southern Ohio, W. Virginia, and Kentucky that have produced bitumen."

97 "Map VIII represents the localities in Michigan and Canada that have produced bitumen."

Then follows a list of twenty-one States and Territories from which no bitumen has been reported.

Next is a list of thirteen "States and Territories in which solid bitumen occur." A description accompanies reference to each deposit.

Pages 20 and 21 contain a list of five "States and Territories in which semisolid bitumen occurs," with description. Pages 21 and 27 contain a descriptive of all the "States and Territories in which liquid or gaseous bitumen occurs."

This article treats of the oil and gas wells of New York, Pennsylvania, Ohio, W. Virginia, Indiana, and other States in which the liquid and gaseous bitumen occur.

Following this is a résumé in section 2:

"Geological distribution of bitumen in foreign countries," in which occurrence of solid, semifluid, liquid, and gaseous bitumens discussed in an article of nine quarto pages.

This report of the United States census agent, Professor Peckham, continues, pp. 37 to 52—with Chapter III—The Geological Occurrence of Bitumen, of which the following is the first paragraph:

"The relation of geology to the occurrence of bitumen has been very liberally discussed during the last half of the century. In attempting to review the literature of this subject, one is impressed with the fact that for the most part the opinions expressed may be said to be provincial, inasmuch as they are based on observations made over a comparatively limited area, and for these limited observations generalizations are often made to include all of the varied conditions under which bitumen

98 occurs in different parts of the world. My intention has been to compile this chapter from the papers of professional geologists who have directed their attention to the subject, and it is while attempting this work that the provincial characters of the materials that I have to compile, and the great lack of uniformity of opinion among eminent geologists who have written upon the subject, have been most forcibly impressed upon me. Again, when comparing the earlier and the later authors, there is a lack of uniformity in nomenclature that renders the task of one seeking information extremely difficult. Deposits of bitumen in different parts of the world have been described by persons whose knowledge of geology is often of an extremely elementary character, yet almost every author has mentioned a tar or petroleum spring endeavors to the rock from which it issues and discusses the origin of bitumen."

This chapter discussed in detail the geological formations throughout the world in which bitumen especially petroleum and natural gas, occur.

Chapter IV on the chemistry of petroleum occupies five quarto pages. The article begins with this statement:

"The wide distribution of bitumen in nature has already been noticed."

The second paragraph begins as follows:

"The first research among fluid bitumen or petroleum was made by Vanquel in 1817. (P. 55.)

"An examination of paraffine and its chemical relations showed that it was one of the higher homologues of marsh gas, hence the English

chemists have called the whole series paraffines, including the solid, liquid, and gaseous members."

Chapter V. "The origin of bitumens" extend from page 59 to 75.

99 In discussing the various theories of the formation of bitumen the introduction to this chapter states:

"Generally speaking, they fall into three different categories, embracing those who regard bitumen as a distillate produced by natural causes, those regarding bitumen as indigenous to the rocks in which it is found, and those who regard bitumen as a product of chemical change in natural products, of which carbon and hydrogen are constituents, and those who advocate a purely chemical reaction between purely mineral and inorganic materials.

"Comment: Whichever of these th'ories or combination of them is accepted natural gas, a mixture of methane, with olefines and other gases, is (1) a crude paraffine; (2) crude bitumen, and (3) crude mineral. None of these theories nor any of their modifications controvert this conclusion."

M. Mendeljeff, one of the most eminent among modern chemists, investigated the petroleum and natural gas of Russia, and in a paper before the Chemical Society of St. Petersburg (Feb. 25th, 1877) states an explanation of the origin of bitumen:

"There is a condensation of metals at the center of the earth, and among these it is natural to presume iron would predominate. Admitting further the existence of metallic carbides, it is easy to find an explanation not only for the origin of petroleum, but also for the manner of its appearance in the places where the terrestrial strata at the time of their elevation into mountain chains ought to be filled with crevices to their center. These crevices have admitted water to the metallic carbides. The action of the water upon the metallic carbides at an elevated temperature and under a high pressure has generated metallic oxides

100 and saturated hydrocarbons, principally methane (marsh gas) (CH), which being transported by aqueous vapor have reached those strata where they would easily condense and impregnate beds of sandstone, which have the property of imbibing great quantities of mineral oil."

This explanation is one of the clearest and most respected opinions that have ever been written on the subject.

Continuing, Mr. Mendeljeff states: "In order to make this question clear, it is indispensable to study the different transformation of petroleum, its decomposition into natural gas (methane) and nonsaturated hydrocarbons, of determining the chemical nature of mineral oils of different origin, etc."

Continuing the discussion, Professor Peckham states: "The most conspicuous advocate of the theory that petroleum is a product of chemical reaction by which marsh gas (methane) is converted into bitumen is M. Coquand, who has so fully written upon the occurrence of bitumen in Albania and Roumania."

M. Grabowski, in an article on ozocerite, having advanced similar opinions with reference to marsh gas (methane), says: "It appears to me to be very probable that it has to be considered as a product of the oxidation and condensation of the petroleum hydrocarbons. By this hypothesis the formation of petroleum may be reduced to an oxidation of marsh gas, and thus the close connection between ozocerite, petroleum, and coal be explained in the most simple manner."

Comment: Ozocerite is "mineral wax," which is everywhere recognized as a mineral, and its close relation to marsh gas (methane), as explained by Babowski, shows the formation of a distinctively mineral substance from methane, the chief constituent of natural gas.

101 Dr. J. J. Newberry, formerly State geologist of Ohio, in discussing the origin of bitumen, states:

"This process consists mainly in the union of hydrocarbons, with a proportion of carbon to form carbureted hydrogen, which perhaps escapes, and the hydrocarbon constituting the bitumen, which usually remains a black, pitch-like mass, investing the fixed carbon. By this process peat, lignite, and coal are formed, which are solids, and doubtless some liquids and gaseous hydrocarbons escape. Now, when we heat these solid bitumens artificially at a sufficiently high temperature they are converted into gaseous hydrocarbons—principally methane or 'natural gas.'"

Daubree says: "Bitumens and other carbides of hydrogen, according as their state is solid, liquid, or gaseous, whether impregnating beds flowing as petroleum, escaping from the soil, as in salses, mud volcanoes, burning springs, etc., are in general only the vent holes of deposits of bitumen."

On pages 67 and 68, Prof. Peckham states: "The studies which I have made upon petroleum, extending now over a period of more than twenty years, and especially those which I have in preparing this report, lead me to the conclusion that all bitumen have in their present condition originally been derived from animal or vegetable remains, but that the manner of their derivation has not been uniform."

In classifying the different kinds of bitumen, Prof. Peckham says: "There are four kinds of bitumen:

"1. Those bitumens which form asphaltum and do not contain paraffine.

"2. Those bitumens which do not form asphaltum and contain paraffine.

"3. Those bitumens that form asphaltum and contain paraffine.

102 "4. Solid bitumens that were originally solid when cold or at ordinary temperature."

The natural gas and petroleum of New York, Pennsylvania, Ohio, and West Virginia are discussed in detail under the second class, namely, those bitumens do not form asphaltum and contain paraffine.

In further discussing the origin of bitumen, Coquad says (p. 73): "The volcanic phenomena assume these forms:

"First, when inflammable gases escape through the soil.

"Second, when they escape with water and petroleum, forming craters of bitumen.

"Third, volcanoes emitting hot water."

M. A. Riviere has published a paper on "The origin of combustible minerals," in which reference is made to petroleum and other bitumens as being formed from marsh gas (methane) or "natural gas," since natural gas consists almost entirely of methane, and in several instances is pure methane.

After discussing "The production of oil," "Petroleum in commerce and the statistics of the industry," Prof. Peckham's report takes up "Paraffine" in Chapter IV. Section 1 deals with the "History," and section 2 "Sources of crude paraffines."

"Crude paraffine is found fossil in Galicia, Roumania, the Caucasus, the neighborhood of the Caspian Sea, and in Sanpete Valley in Utah. In all of these localities, except the last, it is found in a formation that yields petroleum and also contains paraffine. Paraffine is also a constituent of a large majority of the different varieties of petroleum found upon the earth's surface, and also of the asphaltum that occur in injected
103 veins, such as alberite, grahamite, and the asphaltum of Cuba.

As a produce of destructive distillation paraffine is obtained from all kinds of bituminous coal, shales, lignite, peat, wood, and animal remains, provided the distillation is conducted at a sufficiently low temperature.

"The manufacture of paraffine from ozocerite is effected by distillation over direct fire from iron retorts with flat bottoms containing from 1,500 to 2,000 pounds. The product' of the distillation are:

Benzine	2 to 8	per cent.
Naphtha	15 to 20	"
Paraffine	36 to 50	"
Heavy (lubricating) oils	15 to 20	"
Coke	10 to 20	"

After discussing the preparation and properties of paraffine, Prof. Peckham concludes this portion of his report as follows:

"It has been found impossible, in the amount of time that I have been able to devote to this portion of the subject, to call attention to all the great number of specific investigations that have been made upon paraffine, and the difficulty of attempting an exhaustive discussion of the subject is increased by the obscurity of the nomenclature. Paraffine in the United States, and in the languages of continental Europe, is used to signify the solid hydrocarbons obtained in distillation made at low temperature, but in England the word has been given a much wider signification, it having been applied to all of the fluid products of such distillation belonging to the marsh-gas series (CH)."

Comment: Here again is substantial evidence of the broad and generic use of the term paraffine, the wider significations, as used in England, being sufficient to include natural gas within the meaning of the
104 word paraffine, and it is in all countries clearly within the scope of the term crude paraffine.

Part III of Peckham's report deals with "The uses of petroleum and its products."

Chapter I of this part discusses "The uses of petroleum for lubrication."

Chapter II, "The uses of petroleum and its products for illumination."

Chapter III, "Natural gas and the carbureting of gas and air."

In the course of section 1—"Occurrence and composition *of* natural gas"—the report states: "Dr. Austed appears to think that burning springs are immediately related to mud volcanoes; but in the United States, east of the Mississippi River, where mud volcanoes are unknown, it appears that gas springs are the product of the same kind of action that has produced petroleum, and they often accompany petroleum."

Professor Austed "observed copious discharges of gas, petroleum, and mud from the mud volcanoes of the valley of Pascara, in Italy, and also

in Crimea. I do not, however, interpret these phenomena as volcanic, or as in any manner an association of cause and effect, but rather as associated incidents of the dying out of the metamorphic action which has, in most cases, by invasion of strata containing organic matter, distilled all of the forms of bitumen, including inflammable gas."

The observations of Wall confirm this hypothesis in the most striking manner:

"Not the slightest evidence that volcanic action ever has obtained in the Appalachian region has been observed; but all the geological features, which have already been so fully discussed on previous pages of this report, lead to the conclusion that petroleum and natural gas have
105 been produced by the same cause. That volcanic action is not that cause is further shown by a comparison of the analysis that have been made of natural gases from various localities."

After comparing the composition of the natural gases of different portions of the world, the report continues:

"A comparison of these results of analysis shows the great difference between the constituents of the gases from these two sources. In the gases from burning springs, CH predominates, accompanied by other products of distillation; in the gases from solfataras, CO predominates, accompanied by other products of the combustion of carbon. The distillation of strata, rich in organic remains, when invaded by metamorphic action, has doubtless produced the inflammable gases of burning springs and gas wells in a manner analagous to and often simultaneous with the production of petroleum."

Continuing, the report deals in minute detail with the properties of natural gas and statistics of the industry.

The report finally closes with Chapter VIII—"The bibliography of bitumen and its related subjects," including 423 references, which is introduced in the following paragraph:

"An examination of the literature of petroleum shows that the subject is properly treated as a portion of a general subject, bitumen. It is impossible to separate it from asphalt, maltha, or mineral tar, rock oil, earth oil (German Erdol), naphtha, coal oil, and paraffine. These several subjects are also treated as pertaining to history, geology, chemistry, technology, commerce, and statistics, and often in such a manner as to render separation impossible. In ascertaining what articles have appeared in different periodicals, the indices have been searched for 'asphal-
106 tum,' 'bitumen,' 'gas,' 'hydrocarbons,' 'maltha,' 'mineral tar,' 'naphtha,' 'oils,' 'paraffines,' and 'petroleum,' with the equivalents in other languages."

This report is quoted at length because it records the results of an official investigation reported to the Superintendent of the United States census, and because it is a more exhaustive treatise upon science, technology, and commerce of all varieties of crude bitumen, including natural gas, than exists elsewhere in language.

The report of Prof. Peckham consists of 300 quarto pages with numerous illustrations and maps, "showing the distribution of bitumen throughout the world; showing the deposits that produce bitumen in United States and Canada," bitumen-producing localities in southwestern Ohio, Virginia, and Kentucky; "showing the locality in Michigan and Canada

that have produced bitumen; showing the bitumen springs in Texas and Louisiana," etc., etc. Further discussion of the mining and manufacture of the various bitumens and the report is a contribution to the mineralogy of this subject.

In discovering the literature of the subject Professor Peckham states in his letter of transmittal to the Superintendent of the Census: "Very few bound volumes have been devoted to the general consideration of the subject, and none of these, while each valuable as presenting some of its particular aspects, were to be considered as embracing the results of a comprehensive research with reference to all of its varied details. It was therefore thought advisable to make this report and authority upon the subject of which it treats."

Natural gas is considered frequently in the treatment of other crude bitumens and paraffines, and is separately discussed in forty-five quarto pages, which comprise chapter three of part three of this report.

107 This classification of natural gas with the other crude bitumens could not have been influenced by the commercial importance of asphalt, a typical crude bitumen, because no statement of the production of asphaltum is given in the reports of the Tenth U. S. Census, and the subsequent publications of the Government do not indicate that natural gas has been classified as crude bitumen by reason of the position given to asphaltum. It was thus officially classified before the production of asphaltum became a commercial industry.

It is, however, in common with asphaltum (a similar substance), crude bitumen, and is therefore properly classified as such, and as a crude mineral in both the Tenth and Eleventh U. S. Census Reports and all intermediate publications which deal with its production or classification.

Closely related to the compendious report of Prof. Peckham, as special agent in charge of the technology of petroleum and its products to the Tenth U. S. Census, is the fact that since the beginning of the publication of a report on the mineral resources of the United States in 1883 the chief of division of mining statistics has included natural gas in his annual report to the Director of the U. S. Geological Survey, who in turn has embodied these reports more or less completely in his annual report to the Secretary of the Interior.

A report on mineral resources for 1885 devotes twenty-four pages to the composition, occurrence, utilization, and statistics of natural gas.

The volume for the following year devotes twenty-eight pages to the location in which gas is found, its geological distribution, its production and transportation, and other features of the technology and statistics of natural gas.

108 A similar report for 1887 contains thirty-nine pages devoted to a further consideration of natural gas among the mineral resources of the United States.

The last published report, 1888, contains 110 pages, in which natural gas (thirty-two pages) is treated with petroleum, asphaltum, and ozocerite as a distinctive mineral.

The report on mining statistics and technology for the year 1889 was deferred for the purpose of incorporating it with the census of 1890, and the information obtained by the chief and assistants for the years 1889 and 1890 are now compiled and will form a part of the report of the

Eleventh U. S. Census, wherein natural gas will be classified, as in the Tenth United States Census, with other forms of "native," "natural," or "crude bitumens," such as asphaltum, ozocerite, and petroleum.

Bulletin No. 75 of the U. S. Census for 1890 is devoted to the minor mineral industries, such as asphaltum, gypsum, soapstone, sulphur, and pyrites, in which the introductory summary states as follows:

The value for the domestic production for 1889 of the minerals treated of in this bulletin is as follows:

Asphaltum	$172,537.00
Ozocerite	2,500.00
Asbestus	1,800.00
Graphite	72,662.00
Gypsum	764,118.00
Soapstone	231,708.00

etc., etc. Besides the production of the minerals embraced in the preceding statement the report contains valuable information regarding their uses, recent developments, etc.

(Signed) ROBERT P. PORTER,
Supt. of Census.

Asphalt and ozocerite are here again classified distinctively as
109 minerals, and, being typical crude bitumens, it follows that natural gas, which is elsewhere similarly classified, must also be crude mineral, not advanced in value or condition by refining or grinding or by other process of manufacture.

The official report on asphaltum gives as follows:

"Gilsonite, elaterite, uintite, wurtsilite, albertite, grahamite, asphaltum, malth, and brea are names given to semisolid bitumen, which differ considerably from one another in their chemical composition, in their actions with acids or other agents, and upon the application of heat; but as every one of them has been called asphaltum, for the purpose of the Eleventh Census, it is deemed advisable to group them under that head. This is partly for convenience, but particularly because asphaltum is the common term applied to the class when used industrially, the varieties being designated by the producing locality, and because these substances, through somewhat different processes of manufacture, are used for the same purposes. Asphaltum will be distinguished in this report from asphalt, in that the latter term is usually applied to the manufactured article used for street paving, while the crude mineral is better known as asphaltum," thereby reiterating the statement and classification of crude bitumen as crude mineral.

The Census Bulletin, No. 75 of the Eleventh U. S. Census, of the Minor Mineral Industries further speaks of gilsonite and uintite as names given to the asphaltum of Utah, which is the purest that has yet been found. "The crude mineral contains about 90 per cent of bitumen. Natural gas, also crude mineral, contains 97.2 per cent of bitumen.

This report further shows that gilsonite (the Utah asphaltum) was discovered by Mr. S. H. Gilson, of Salt Lake City, by whose name the
mineral is generally known in commerce.

110 The tariff act of 1890 fails to specify gilsonite in any of the schedules of classification, but had it been found elsewhere than

in this country would certainly be exempt from duty as crude bitumen, and also as crude mineral. The same is equally true of natural gas.

This official report further refers to the "deposits of solid asphaltum and springs of viscid, oily material, commonly called brea." The report dealing with the natural gas is in preparation by the division of mines and mining of the Census Office.

It is also a notable fact, as further showing the precedent for the classification of natural gas as crude mineral, that it (natural gas) is placed in the list of nonmetallic minerals in the fourteenth number of the Statistical Abstract of the U. S. for 1891, prepared by the Bureau of Statistics under the direction of the Secretary of the Treasury, which was transmitted to the Speaker of the House of Representatives, December 9, 1891, by O. L. Spaulding, Acting Secretary of the Treasury.

This official report is divided into thirty-nine titles or subdivisions. One of these (the 10th) deals with mineral production, and on page 52, Table 30, is given "the quantities and values of minerals produced in the United States during the calendar years from 1886 to 1890, inclusive.

Productions (nonmetallic): Pennsylvania anthracite, building stone, petroleum, lime, natural gas, cement, phosphate rock, salt, etc.

111 Natural gas is here again classified as a distinctive mineral, and its commercial value is given as such for the years 1886, 1887, 1888, 1889, and 1890.

Another instance of the official classification of natural gas as a mineral occurs on page 903 of a report on the internal commerce of the United States for the year 1890, by the Chief of the Bureau of Statistics to the Secretary of the Treasury, under date of December 20th, 1890, being part 2, Commerce and Navigation, dealing with the commercial industries and other interests of the States lying west of the Rocky Mountains.

The memorandum referred to occurs in the discussion of the famous resources of Utah, and the table of the minerals is prefaced as follows:

"The following list of minerals is as complete as it is possible to make it after securing all the information that can be obtained at present."

LIST OF UTAH MINERALS.

Then follows a tabulated list of minerals in which are mentioned: Ozocerite, gilsonite, crude asphaltum, petroleum, natural gas, wheelerite, amber.

These and numerous other official classifications of natural gas as crude bitumen, crude paraffine, and crude mineral, occur in the reports and documents of the Federal Departments, especially of the Interior and the Treasury.

112 The production of natural gas, as a commercial industry, began with the beginning of the decade recently closed, and the Director of the United States Geological Survey did not incorporate the statistics or other information concerning the industry in his administrative report to the Secretary of the Interior, until the seventh annual report was presented, October 1st, 1886. This and all subsequent reports of the Geological Survey classify natural gas as a mineral, and thus classified give the information concerning it.

The following reference will serve to illustrate this official classification. Page 39 of the seventh annual report contains a tabulated statement of the nonmetallic mineral products of the United States in 1885, in which natural gas is classified as such with asphaltum, petroleum, asbestus, phosphate rock, etc.

Page 132 of the same report contains a statement of the commercial value of natural gas produced in 1884 and 1885. This report also states "the yield has increased tenfold since 1883." In each of these instances natural gas is classified as a mineral, and being in its "native" or natural condition as obtained from the earth, is therefore crude mineral.

The Eighth Annual Report of the Director of the Geological Survey to the Secretary of the Interior, in addition to giving the information as to the value, etc., of natural gas produced in 1886 and classified as nonmetallic mineral, contains the following:

"Since the commencement of the present decade a newly discovered mineral resource of great importance to the country has attracted widespread attention, and in consequence of its application new industries have grown up and certain old industries have modified. The discovery
of large quantities of natural gas and its utilization in Pennsyl-
113 vania five or six years ago, very rapidly followed by discoveries in Ohio, and as the official geological survey of these States investigated the deposits in each and the condition under which natural gas may be found, rules for the guidance and exploitations in new fields were developed, and field after field was opened, not only in these States, but also in New York, West Virginia, Kentucky, Indiana, Illinois, Kansas, and Wyoming Territory; and natural gas is now extensively utilized in most of these States as a fuel and in some cases as an illuminant."

Realizing the importance of this new resource, the Geological Survey has taken part during the past year in investigations relative to it.

The ninth report of the Geological Survey to the Secretary of the Interior contains the same classification of natural gas as a mineral, giving its value for the year 1887 as $15,838,500.00, together with other statistical information.

The tenth and latest report of the Geological Survey to the Secretary of the Interior, under date of July 25th, 1889, continues the classification of natural gas as a mineral, giving the value of the product in 1888 as $22,662,128.00.

Page 149 of this same report contains the following:

"THE WORK ON ROCK GAS.

"During the last fiscal year Dr. A. J. Phinney was employed to investigate the rock gas field of Indiana, and toward the end of the year he submitted a report thereon for publication. Within the last lustrum rock gas has become one of the more important among the mineral resources of the rocks, particularly in the northeastern central portion United States; and pari passu, with the development of these resources, geologic science has within the past two years taken an enormous stride.
114 Much was, indeed, known by a few special students of the genesis of the bitumens, including the natural gas now so extensively

utilized in half a dozen States; yet this knowledge was not generally disseminated, and the simple laws governing the distribution of gas and oil were not understood.

"So when the exploitation of rock gas was commenced in Pennsylvania and Ohio, the geologist was alike unable to guide efforts or predict results; yet so fully did the systematic student avail himself of the opportunities for observation afforded by prospecting that within two years the laws governing the accumulation and distribution of the light bitumens were made known, and their presence or absence can now be prognosticated with as great certainty as that attending the prognostication of artesian water. A considerable part of this advance in science resulted from investigations in the great Indiana gas fields, and a large part of these investigations were made, carefully recorded, and prepared for publication by Dr. Phinney."

This discussion of natural gas, or "rock gas," in Indiana, gives every justification to the classification of natural gas as crude bitumen, and, as such, discusses its origin and development. The complete report, however, was received too late for publication.

Another official document, dealing alike with the scientific and commercial features of natural gas, is the report on economic geology by the director of the State geological survey to the legislature of Ohio. About six hundred pages of this are devoted to petroleum and natural gas.

Chapter 2 is entitled "The origin and accumulation of petroleum and natural gas," in which Prof. Edward Orton, director of the survey, writes as follows:

"Natural gas and petroleum belong in a list of products of the crust of the earth to which we give the name of bitumens. Other
115 bodies in the same list are the semifluid, maltha, and the solid, asphaltum. They are found under the same conditions, and the transitions from one to another, as of petroleum to asphalt, can be often noted. They are technically known as hydrocarbons, carbon and hydrogen constituting almost their entire substance, the former making about 85 per cent and the latter about 13 per cent.

A. ORIGIN.

The theories as to the origin of petroleum and natural gas can be divided into two main groups, viz: (1) Those which refer these bodies to inorganic sources, or, in other words, which make them the result of chemical affinity acting on mineral matter, and (2) the theories that regard them as the result of a partial decomposition of vegetable and animal substances that have been stored up in the rocks.

These two classes of theories will be briefly considered.

I. THEORIES OF CHEMICAL ORIGIN.

"It has been claimed by a number of chemists, some of whom have high standing in the scientific world, that the several members of the series now under consideration can be referred to a purely mineral origin.

"1. In 1866 the distinguished French chemist, Berthelot, propounded a theory that would, in his views, account for all of the natural hydrocarbons in this way. He supposed the alkali metals, viz, potassium and sodium, to exist in the interior of the earth in a free or uncombined state, and necessarily at a high temperature. If, now, water carrying in solution carbonic acid—and the crust of the earth abounds in both—should find access to these metals he pointed out the steps of the chemical action
that must take place and that would result in the formation of a
116 series of hydrocarbon compounds. In this case the process of oil and gas formation would be deep seated and continuous, the reactions that give birth to them being constantly renewed in the recesses of the earth.

"2. Another theory that invokes chemical force only for the origin of these bodies was advanced by the eminent Russian chemist, Mendeljeff, in 1877. It attracted a large measure of attention and interest throughout the scientific world. He supposed the interior of the earth to contain large masses of metallic iron, and also metallic carbides (compounds of carbon and metals), all at a high temperature. The current of water under these conditions with these bodies would, in his view, generate metallic oxides and hydrocarbons. Mendeljeff, accordingly, holds that petroleum is never of organic origin, but is as purely a product of chemical action as a vein stone or an ore. It would follow from this theory, also, that the process of oil and gas formation is continuous.

"There are several other theories of the same general character, but none that have been supported by as great authority, or that have attracted as wide attention as the two already named."

II. THEORIES OF ORGANIC ORIGIN.

"The theories of the next class stand on a very different footing from those already named. According to them petroleum and natural gas are derived from vegetable and animal matter contained in the rocks in which they are found or in associated strata. The argument for this view is simple and direct. Compounds similar to or identical with petroleum and natural gas are easily derived by the process of destructive distillation from both vegetable and animal substances, as from wood, peat, bones,
oil, etc.
117 "The manufacture of artificial gas from bituminous coal is also a familiar illustration of the possibilities in this direction. Bituminous shale may be substituted for coal in the manufacture, and may be made to yield a series of these bituminous products, including both petroleum and gas.

"Further than this, the decay of vegetation at ordinary temperatures gives rise to light carbureted hydrogen, or marsh gas, if the air is excluded from the decaying substances. These conditions are not when vegetable matter, as wood and leaves, is buried at the bottom of ponds and lakes or, on a larger scale, in the beds of glacial drift. As is well known, large accumulations of ancient vegetation are buried in or beneath the bowlder clay in many parts of the country, and these masses sometimes yield gas in large enough amount to be of economic value. Peat

bogs not only yield inflammable gas, but sometimes produce other members of the bitumen series, nearly allied to petroleum and asphaltum, as has been shown by many competent observers, and among them the veteran English geologist, E. W. Binney, may be especially named. In a word, it is scarcely too much to say that, in the natural or decomposition of organic substances in the absence of air, both petroleum and gas are normal products."

This explanation of the origin of petroleum is sustained by Dr. T. Sterry Hunt, of Montreal, who is widely known and esteemed as a writer upon chemical and geological topics; also, by Prof. J. B. Lesley, director of the second geological survey of Pennsylvania. Page 66 of this report contains the following:

"Prof. J. D. Whitney has expressed the belief that all of the
118 bituminous minerals of California, including asphalt and petroleum, are derived from the remains of infusoria in mineral limestone."

Prof. J. S. Newberry, in Vol. I of the Geological Survey of Ohio, states:

"The origin of the two hydrocarbons (petroleum and gas) is the same, and they are evolved simultaneously by the spontaneous distillation of carbonaceous rocks."

In further discussing the theory of formation (page 74), "Hunt denies that the so-called bituminous shales," except in rare instances, contain any petroleum or other form of bitumen.

One of the most important papers on petroleum formation is Wall's report on the Trinidad asphalt. A remarkable passage occurs in this report, which bears directly on the subject before us:

"When in situ, it (the asphalt) is confined to particular strata which were originally shales containing a certain proportion of vegetable debris. The organic matter has undergone a special mineralization, producing bituminous in place of ordinary anthraciferous substances. This operation is not attributable to heat nor to the nature of distillation, but it is due to the chemical reaction at the ordinary temperature and under the normal conditions of the climate. The proofs that this is the true mode of the generation of the asphalt reposes not only on the partial manner in which it is distributed in the strata, but also on numerous specimens of the vegetable matter in process of transformation and with the organic structure more or less obliterated. After the removal by solution of the bituminous material under the microscope, a remarkable alteration and corrosion of the vegetable cells becomes apparent, which is not
119 presented in any other form of a dense, oily liquid from which the volatile elements gradually evaporate, leaving a solid residue."

Wall's testimony is confirmed by other authorities.

This report was made to a department of the English Government by a scientist sent to the island of Trinidad to investigate the deposits of crude bitumen, and published in the Quarterly Journal of the Geological Society, volume 16. The processes referred to are strictly those of nature, indicating how natural gas, as well as petroleum and asphaltum, are formed, and showing their relation to each other as crude bitumens.

The natural gas of Ohio has been analyzed by Prof. C. C. Howard, of the Ohio State University and the State Geological Survey, and the several gas fields yield the following results:

	Fostoria.	Findlay.	Muncie.	Anderson.	Marion.
Hydrogen	1.89	1.54	2.35	1.86	1.20
Marsh gas	92.84	93.35	92.07	93.07	93.58
Olefiant gas	.20	.35	.25	.49	.15
Carbonic oxide	.55	.41	.45	.73	.60
Carbonic acid	.20	.25	.25	.26	.30
Oxygen	.35	.39	.35	.42	.55
Nitrogen	3.82	3.41	3.53	3.02	3.42
Sulphureted hydrogen	.15	.20	.15	.18	.20

These results of analysis show the Ohio gas to be practically identical with the natural gas from Canada.

Throughout this comprehensive treatise upon the scientific and commercial features of natural gas it is shown to be crude paraffine, and is classified as crude bitumen and crude mineral.

Another official report, which has a direct bearing upon the question at issue between the Buffalo Natural Gas Company and the Government, is the comprehensive report containing the results of the investigations
120 of natural gas by Prof. Francis C. Phillips, of the Western University, to the board of commissioners of the second geological survey of Pennsylvania.

This report describes natural gas as obtained from several of the most productive fields in Pennsylvania to consist chiefly of the hydrocarbons of the paraffine series, together with nitrogen, and a small proportion of carbon dioxide and traces of oxygen.

On the introductory page of this report the following appears:

"In combination with carbon, in the form of hydrocarbons, hydrogen constitutes about one-fourth by weight of the combustible portion of the natural gas now being used as fuel in Pennsylvania.

"These hydrocarbons, which represent approximately nine-tenths by volume of natural gas, are divided into two classes, paraffines and olefines. Of the paraffines the best known and most abundant is methane (CH), consisting of 25.03 per cent hydrogen and 74.97 per cent carbon by weight.

"Methane is, like hydrogen, a product of the destructive distillation of coal, and consequently constitutes a large proportion of ordinary coal gas.

"The Hukill well, Lyon's Run, south of Murrysville, as already stated, yields marsh gas in nearly a pure condition. Methane contains in one cubic foot two feet of hydrogen, and hence in the union of the carbon and hydrogen a considerable condensation occurs. Methane is the typical and best-known member of a large group of hydrocarbons, which exhibit a remarkable resemblance in chemical relationships.

"The first four hydrocarbons are gases, but are more and more easily condensable to the liquid form in proportion as the amount of carbon is greater. The higher paraffines are solid. Common 'paraffine
121 wax' contains several of the highest members, while methane (CH_4) constitutes from 50 per cent to 90 per cent or more of Pennsylvania natural gas.

"Ethane (CH_4), the next member of the series, occurs in smaller quantity. Concerning the higher members, propane (C_2H_6) and butane

(C_3H_8), very little is as yet known, but there is reason to think that they are of common occurrence. Pentane (C_5H_{12}) is found in the highest distillates from petroleum, and the higher members are found in abundance in crude oil."

This report gives the result of a large number of analyses of Pennsylvania gas representing the numerous fields in use, and, while there are variations to some extent, these results show Pennsylvania gas to be substantially the same in composition as the natural gas from Canada.

In reference to the composition Prof. Phillips states:

"The samples examined may be said to consist mainly of the hydrocarbons of the paraffine series, among which methane predominates."

It is to these bodies that the fuel value of the gas is due.

Inasmuch as most of the gas conveyed through pipe lines deposits little or no liquid hydrocarbons, it is evident that the higher paraffines are not present in notable quantity.

Following this report by Prof. Phillips is a list of books, papers, and references on rock oil and gas, which is a complete bibliograph of bitumen, including references, journals, and transactions of societies.

This report still further sustains the classification of Canadian natural gas, by showing in this report the close relation or identity of Pennsylvania gas with Canadian gas, and thereby rendering practicable
122 to the natural gas all the observations as to the classifications which have been shown to apply to the gas of American fields.

Similarly corroborative testimony is presented throughout A Practical Treatise on Petroleum, comprising its Origin, Geology, Geographical Distribution, History, Chemistry, Mining Technology, Uses, and Transportation; together with a Description of the Gas Wells, the Application of Gas as Fuel, etc., by Benjamin J. Crew, with an Appendix on the Product and Exhaustion of the Oil Regions and the Geology of Natural Gas in Pennsylvania and New York by Charles A. Ashburner, M. S. C. E., Geologist in charge, Pennsylvania Survey.

This is a treatise of 500 pages, from the practical and commercial standpoint.

(Crew was engaged in the business of refining petroleum from the beginning of the industry to time of his death in 1885.)

Further corroborative evidence of the most direct kind is contained in the report (just issued) of Prof. Edward Orton, to the director of the geological survey of Kentucky, on the occurrence of petroleum, natural gas, and asphalt rock. Professor Orton's letter of transmittal begins:

"I herewith transmit the manuscript of the report which I have prepared under your directions on the various products of the bituminous series, viz, inflammable gas, petroleum, tar springs, and asphalt rock as they occur in the western half of Kentucky."

The first chapter is entitled "The early history of petroleum and its derivations," and states:

"Petroleum, strictly speaking, is to be distinguished on the one hand from volatile naphtha, and on the other from the semifluid mineral tar, which is sometimes called maltha, but the boundary lines on both
123 sides are definite. Mineral tar passes in turn into mineral pitch or asphalt, a black or brownish-black solid, which breaks with a conchoidal fracture, and which melts and burns at comparatively low

temperatures. The naphtha above referred to gives rise to natural gas in its volati'zation; and then the series, fully expanded, is seen to consist of these five distinct and separable substances, viz, natural gas, naphtha, petroleum, mineral tar, mineral pitch, or asphalt. In chemical composition they are all hydrocarbons, belonging principally to methane or marsh-gas series."

This report is an official document of 220 pages, in which natural gas is discussed in detail with petroleum and asphalt; and throughout it is considered and classified as crude bitumen and a crude mineral.

Such is the evidence presented by the composition of the gas and its classification in official reports which deal with its technology and commerce.

This classification is also found in the authentic text-books upon mineralogy, in the glossaries appended to works on popular science, and in the compendious work of reference, such as encyclopædias and dictionaries.

For instance, Dana's Mineralogy, last edition, page 1, contains the following:

"Minerals are the materials of which the earth consists, and plants and animals, the living beings over the surface of the mineral-made globe. A few rocks, like limestone and quartzite, consist of a single mineral, but most of them are mixtures of two or more minerals. Through rocks of each kind various other minerals are often distributed, either in a scattered way or in veins or cavities. Gems are minerals of jewelry and ores, those that are important for the metal they contain.
124 Water is a mineral, but generally in an impure state from the presence of other minerals in solution. The atmosphere and all gaseous materials set free in volcanic and other regions are mineral in nature, although, because of their invisibility, seldom found among the specimens in mineral cabinets. It is sometimes said that minerals belong to the mineral kingdom, as plants to the vegetable kingdom and animals to the animal kingdom. Substituting the term 'inorganic' for 'mineral,' the statement is right. For as there are the two kingdoms of life, so there is in nature what may be called a kingdom of grand division, including all species not made through the organizing principles of life. But this inorganic kingdom is not restricted to minerals. It embraces all species made by inorganic forces; those of the earth crust or surface, and also whatever may form under the manipulations of the chemist. The laws of composition and structure, exemplified in the constitution of rocks, are those also of the laboratory. A species made of art, as we term it, is not a product of art, but a result solely of the fundamental laws of composition, which are the basis of all materials in existence, and the chemist supplies the favorite conditions for the action of those laws. Mineral species are then but a very small part of those which make up the inorganic kingdom or division of nature."

The index to Dana's Mineralogy under the title "Description of minerals," is as follows:

"1. Minerals consisting of acid elements.
"2. Minerals consisting of basic elements.
"3. Silicates.
"4. Hydrocarbons (natural gas)."

In Applied Geology, by Samuel H. Williams (professor of
125 geology at Cornell University), 1886, at page 178, in the chapter on other mineral light producers, the following are given:

1. Gas and oil obtained by the distillation of bituminous and cannel coals, etc.

2. Petroleum.

3. Natural gas derived from oil-bearing rocks and from wells sunk in bituminous shales, etc.

Worcester's Dictionary gives the following definition: "Mineral, a natural body destitute of organization or life. A substance found in or on the earth which is neither animal nor vegetable (Dana)."

Webster's Dictionary defines "mineral" (No. 3) as anything which is neither animal nor vegetable, as in the most general classification of things into three kingdoms (animal, vegetable, and mineral).

The Encyclopedia Britannica in its article on minerology says: "Natural objects which are homogeneous in their mass, and in which no parts formed for special purposes can be distinguished, are termed minerals, and that branch of natural science which treats on them is termed mineralogy."

Chamber's Encyclopedia says in its article on mineralogy: "To the mineral kingdom belong liquids and gaseous as well as solid substances. Water, atmospheric air, etc., are included in it."

In a Dictionary of Science, Literature, and Art, by W. T. Brande and George W. Cox (article, Mineralogy): "This being the case, it follows necessarily that the science of mineralogy includes the liquids and gases which occur naturally on the surface or in the interior of the earth, because, although the term 'mineral' may not be strictly applicable to them, they are none the less natural substances which can not be
126 comprised amongst others which are formed by the acid of vital forces."

People's Cyclopedia, by W. H. Depuy (article, Mineralogy): "To the mineral kingdom belong liquids, gaseous as well as solid substances. Water, atmospheric air, etc., are included in it."

Zell's Cyclopedia defines "mineral" as any natural body destitute of organization which naturally exists within the earth or at its surface and which is neither vegetable nor animal.

Wright's Universal Dictionary defines "mineral" as the designation of any inorganic substance which naturally exists within the earth or at its surface.

To tax or exempt Canadian natural gas under the tariff act of 1890 would seem to be essentially a chemical proposition. Its position in the schedules would seem to depend upon its composition, and its customary classification in accordance with its composition, as submitted in evidence.

Words are applied to various things, but the technical man, or scientist, is the one who coins terms. Through the scientific journals and the proceedings of societies they gain currency and ultimately become a part of the common vocabulary. The scientific interpretation is usually—and particularly in the present instance, since it is generally sustained—the most exact definition and the safest guide.

This interpretation, as shown in evidence, is sustained by official classification and the consensus of opinion. Although not specifically designated in the act, natural gas is enumerated in the free list of inclusion within the generic term used.

Buffalo, N. Y., May 7th, 1892.

127 The Board further states, in response to the said order of the court, that on several dates succeeding the dates of the protests hereinbefore fully set forth, like protests on similar merchandise were made at the same port against decisions of the said collector to the same effect as the decisions against which the protests hereinbefore set forth were made; that said last-mentioned protests were covered by similar official letters of the collector and raised the same question and contentions as in the protests first mentioned herein, as by the exhibits of said last-mentioned protests, and the papers accompanying them forwarded in a separate enclosure herewith, marked "Exhibit R" and accompanying this return, will more fully and at large appear; and the said last-mentioned protests were decided by the board in the same manner and to the same effect, and the facts found relative to the contentions and issues were found to be identical with the facts found in the decision of the protests above set forth; this return being made so as to put before the court in a convenient form the record and evidence in the several matters specified in the schedule hereto annexed, marked "Exhibit S" and covered by the order of the court to which this return is made, together with a certified statement of the facts involved and the decision of the board thereon.

That on the 20th day of May, 1893, the Board of General Appraisers rendered its decision in the matter of said protests Nos. 8708–B and 11216–B, a copy of which is hereto annexed, marked "Exhibit P."

And there is also hereto annexed a copy of the opinion and decision of the Board of U. S. General Appraisers G. A. 744, marked "Exhibit Q," covering merchandise identical in character, and which is made a part of the decision in this case so far as the same is applicable.

128 EXHIBIT P.

NATURAL GAS.

Before the U. S. General Appraisers at New York, May 20, 1893. In the matter of the protest, 8708 B, etc., of The Buffalo Natural Gas Fuel Company et al. against the decision of the collector of customs at Buffalo as to the rate and amount of duties chargeable on certain natural gas imported per pipe line August 1 and 4 and November 21, 1891.

Opinion by Wilkinson, general appraiser:

The merchandise is natural gas imported at Buffalo from Canada by mains under the Niagara River, and is used as fuel and for illuminating purposes. It was assessed for duty as a nonenumerated unmanufactured article at 10 per cent under the act of October 1, 1890, and is claimed to be exempt from duty (1) on the ground that it is not an article within the meaning of the tariff; (2) as crude bitumen under paragraph 496, and (3) as a crude mineral under paragraph 651.

In G. A. 744 the Board considered and overruled a protest similar to this; but no evidence was introduced in support of the claims, and attention was given chiefly to the first point. We reaffirm the ruling named as to the first and second points, but a lengthy and careful investigation of the subject leads to the conclusion that the third claim in the protest is well founded.

The natural gas in question is similar to that produced in Pennsylvania and Ohio, but it was not imported prior to October 1, 1890; consequently there are no precedents to serve as guides. Nor does it appear that at or prior to the passage of the present tariff act the dutiable
129 character of natural gas was ever considered in or out of Congress. Nor has there ever been any trade or popular designation which would indicate its proper classification for dutiable purposes.

It is proper, therefore, to resort to the evidence of scientific experts and to other authorities bearing upon the question. In considering publications it is not believed that the date is of any moment, provided the source is impartial.

At the several hearings in New York and in Washington, D. C., the board examined a number of well-known geologists and chemists. While there was conflict in the testimony, the preponderance of the evidence was to the effect that natural gas is a crude mineral.

Lexicographers and mineralogists give the word "mineral," in its primary and broadest sense, a definition which would embrace natural gas, although their secondary and limited definitions would not. Nothing appears in the tariff, however, to show that Congress intended the narrower, and not the broader, meaning.

The question has recently been judicially determined in Canada. Section 565 of the municipal act of the Dominion empowers a township to lease or sell the right to take minerals under any highway. The town of Gosfield leased this privilege to the Kingsville Gas Company. The Ontario Gas Company asked for an injunction to restrain the sinking of the well, on the ground that natural gas is not a mineral. In his opinion, Judge Street, of the court of common pleas, stated that according to British authorities "a reservation of minerals includes every substance which can be got from underneath the surface of the earth for the purpose of profit, unless there is something in the context or in the nature of the transaction to induce the court to give a more limited mean-
130 ing," and "it has been laid down that the word 'minerals,' when used in a legal document or in an act of Parliament, must be understood in its widest signification, unless there is something in the context or in the nature of the case to control its meaning. I think myself bound by the authorities to give to the word, when used in this act, its widest signification." The motion was argued May 31, 1890. (The Ontario Reports, Vol. XIX, p. 591.)

The case was carried to the court of appeals. Chief Justice Haggerty rendered the decision November 10, 1891. He said in part:

"There was hardly any attempt to rebut or dispute the accuracy of scientific nomenclature in describing minerals as solid, liquid, and gas. The objection urged was that the legislature (especially at the date of the enactment) could not and did not include natural gas under the term 'minerals.' I can not see how we can qualify the words used by the

legislature when there is nothing in the enactment to explain or limit their ordinary meaning. On full consideration, I have arrived at the opinion that our learned brother could not properly have come to any other conclusion than that natural gas falls within the meaning of minerals in the statute." (Ontario Appeal Reports, vol. 18, pp. 626–632.)

In the reports of the census, the U. S. Geological Survey, and various State authorities, natural gas is enumerated in the list of mineral products and mineral resources.

The Statistical Abstract of the United States, prepared by the Treasury Department, gives on pages 53–55 a table of "quantities and values of minerals produced in the United States, during the calendar years from 1887 to 1891, inclusive."

131 In this category, under the heading of "nonmetallic" on page 54, natural gas is named third in a list of forty, which includes solids and liquids as well as gas.

We find that natural gas is a crude mineral, and sustain the claim that it is exempt from duty under paragraph 651, N. T.

CHAS. H. HAM,
J. B. WILKINSON, Jr.,
GEO. C. TICHENOR,
Board of U. S. General Appraisers.

EXHIBIT Q.

NATURAL GAS.

Before the U. S. General Appraisers at New York, July 10, 1891. In the matter of the protest, 5920–B, of the Buffalo Natural Gas Fuel Company against the decision of the collector of customs at Buffalo as to the rate and amount of duties chargeable on certain natural gas imported per pipe line from Fort Erie, Canada, March 22 and 23, 1891.

Opinion by Sharpe, general appraiser:

We find the facts in this case as follows: The Provincial Natural Gas and Fuel Company of Ontario, Canada, obtain a product of natural gas from the ground by sinking wells therein, which gas is brought from Canada to the city of Buffalo in pipes under the Niagara River, a distance of about twelve miles.

It is sold to the appellants in Buffalo, who, in turn, measure it out to and sell it to their customers. Under an opinion of the Treasury Department (synopsis 10448) the product was assessed for duty

132 by the collector at ten per cent ad valorem under section 4 of the existing tariff.

The protest claims that natural gas is free under paragraph 496 as a crude bitumen, or that it is free under paragraph 651 as a crude mineral.

At the time of the introduction of this natural gas it was supposed that it could be measured by a meter placed on the American side of the Niagara River, but it is represented to us that practical operations developed the fact that the pressure was about 600 pounds to the square inch, and too great for the endurance of any meter.

The collector reports that he was thereupon compelled to resort to the books of the appellants for evidence of the quantity imported, and the

bills of the Ontario corporation furnished to the appellants, accompany the entry of the merchandise, showing the number of feet of gas to correspond with the entry, and being approved by the appraiser at Buffalo.

The quantity imported was approximately ascertained by the amounts shown to have been burned for the month, as recorded by the several private meters taking the gas from the Buffalo company. By a supplementary report the collector shows that the embarrassment arising from the difficulty of measurement has lately been increased.

This natural gas is now furnished for fuel to the city waterworks and to large manufactories, and no reckoning is kept of the amount consumed, as the contract is made between the parties for an amount of fuel gas sufficient to operate the respective works at a price to be computed by the cost of the coal used during the preceding year.

133 These several consumptions are not measured by meter or *or* otherwise, but a large pipe is run into the furnace of such consumers, and the fuel gas flows in sufficient quantities to fulfill the terms of the contract. The customs officials allege that they are left without data other than the estimates of the company.

On this state of things the suggestion is made that the collection of duty upon an article that can not now be measured, weighed, or gauged without depending upon the importer's estimate, tends to bring the tariff laws and regulations into disrepute, and that natural gas should be held to be free, and the letter of the Department is cited in reference to electricity, transmitted by cable from the Canadian to the American side of the Niagara River, to the effect that the same would not be liable to duty. (Synopsis 10086.)

We can not sustain the two contentions of the protest that natural gas is free: (1) Because it is a crude bitumen, or (2) because it is a crude mineral.

The appellants allege that the introduction of this gas does not affect American industries or interests. If this were a legitimate argument for our consideration, we might say that *such* contention does not seem to be reasonable. Indeed, the papers in the case before us show that it already comes into competition with American gas and coal, and that another company is laying a large main across the Niagara River to connect with the Canadian wells.

The papers also reveal the fact that some natural gas is brought to Buffalo from Pennsylvania for consumption, the supply being limited on account of the distance.

We are well aware of the fact that this useful agent can only be drawn from the pockets where nature has placed it. This is also true of the precious metals and of the precious stones, and it is not given us to know how soon these repositories may be enlarged, perhaps to so great an extent as to affect existing conditions.

134 Besides, if natural gas can be imported free for the reasons given in the appellant's argument, why may not gas manufactured from coals subject to duty be claimed to be nondutiable when furnished to consumers by such methods as to make its measurement a matter of difficulty?

Nor can we make this difficulty of measurement the ground for holding the article to be free.

The method of computation, if not provided for by law, is a method of administration, which intelligent officers will reach under the direction of the department, and for these reasons we hold that natural gas is dutiable at 10 per cent ad valorem, under section 4 of the existing tariff, as an unmanufactured article not enumerated.

The decision of the collector is affirmed.

HENDERSON M. SOMERVILLE,
CHAS. H. HAM,
GEORGE H. SHARPE,
Board of U. S. General Appraisers.

And for a certified statements of the facts involved in said matter, as ascertained by them, the said Board states that said facts are fully set forth in the decision aforementioned, and that no other facts were ascertained by said Board than such as are shown by said decision and other exhibits hereto attached.

M. M. SOMERVILLE,
CHARLES H. HAM,
J. D. WILKINSON, JR.,
Board of U. S. General Appraisers.

135 United States circuit court, northern district of New York.

In the matter of the Buffalo Natural Gas Fuel Company.

It is stipulated by and between the solicitors of the respective parties that the printed record annexed hereto shall constitute the record in the court, and the transcript on appeal shall consist of the printed record and the appeal papers.

W. A. POUCHER,
Attorney for the United States.

BISSELL, SICARD, BISSELL & CAREY,
Attorneys for the Buffalo Natural Gas Fuel Company.

136 U. S. circuit court, northern district of New York.

In the matter of the application of the collector of customs at Buffalo, N. Y., for a review of the decision of the Board of General Appraisers as to the rate of duty on certain merchandise imported by the Buffalo Natural Gas Fuel Company.

The undersigned, Buffalo Natural Gas Fuel Company, the respondent in the above-entitled action, hereby consents that Bissell, Sicard, Bissell & Carey be substituted as attorneys for said respondent in the above-entitled action in the place and stead of Bissell, Sicard, Brundage & Bissell.

Dated the 22d day of Dec., 1894.

THE BUFFALO NATURAL GAS FUEL CO.,
JNO. MCMANUS, *Sec'y.*

STATE OF NEW YORK,
County of Erie, City of Buffalo, ss:

On this 22d day of December, 1894, before me, the subscriber, personally appeared John McManus, to me well known, and known to me to

be the secretary of the respondent mentioned and described in
137 the foregoing consent, and duly acknowledged that he executed the same.

W. C. MEADANO,
Commissioner of Deeds for Buffalo, N. Y.

The undersigned, Bissell, Sicard, Brundage & Bissell, attorneys for Buffalo Natural Gas Fuel Company, the respondent in the above-entitled action, hereby consent that Bissell, Sicard, Bissell & Carey may be substituted in our place and stead as attorneys for the said respondent in said action, and that an order to that effect may be taken without notice to us.

Dated January 31, 1895.

BISSELL, SICARD, BRUNDAGE & BISSELL.

138 At a special term of the circuit court held in and for the N. Dist. of N. Y., at U. S. cir. court, N. D. N. Y., on the 5th day of March, 1895. Present, Hon. Alfred C. Coxe, judge.

U. S. circuit court, northern district of New York.

In the matter of the application of the collector of customs at Buffalo, New York, for a review of the decision of the Board of General Appraisers as to the rate of duty on certain merchandise imported by the Buffalo Natural Gas Fuel Company.

On reading and filing the annexed, duly executed, consent of Buffalo Natural Gas Fuel Company, the respondent in the above-entitled action, and the annexed consent, signed by Messrs. Bissell, Sicard, Brundage & Bissell, attorneys for the said respondent in the said action, consenting thereto, now, on motion of Bissell, Sicard, Bissell & Carey, it is—

Ordered, That Bissell, Sicard, Bissell & Carey be, and they hereby are, substituted as attorneys for Buffalo Natural Gas Fuel Company, the respondent in the above-entitled action, in the place and stead of Bissell, Sicard, Brundage & Bissell.

ALFRED C. COXE, *U. S. J.*

139 SIR: Please take notice of an order of which the foregoing is a copy, this day entered in the office of the clerk of the United States circuit court.

Dated, 189 .

BISSELL, SICARD, BISSELL & CAREY,
Attorneys for Respondent, 284 Main street, Buffalo.

(Indorsed:) Filed Mar. 5, 1895. W. S. Doolittle, clerk.

140 United States circuit court, northern district of New York.

In the matter of the Buffalo Natural Gas Fuel Company.

This was an application by the collector of the port of Buffalo for a review of the decision of the Board of General Appraisers sustaining the protest of the importer and holding that the natural gas brought into

this country by pipe line under the Niagara River is a crude mineral, and, therefore, exempt from duty under paragraph 651 of the act of 1890.

The question has twice been before the Board, and two opinions have been delivered by them, which clearly state the facts and the questions in controversy.

The first opinion was delivered July 10, 1891, and is as follows:

"Sharpe, G. A.:

"We find the facts in this case as follows: The Provincial Natural Gas and Fuel Company, of Ontario, Canada, obtain a product of natural gas from the ground by sinking wells therein, which gas is brought from Canada to the city of Buffalo in pipes under the Niagara River, a distance of about twelve miles.

"It is sold to the appellants in Buffalo, who, in turn, measure it out to and sell it to their customers. Under an opinion of the Treasury Department (synopsis 10448), the product was assessed for duty by the collector at ten per cent ad valorem, under section 4 of the existing tariff.

141 "The protest claims that natural gas is free under paragraph 496 as a crude bitumen, or that it is free under paragraph 651 as a crude mineral.

"At the time of the introduction of this natural gas it was supposed that it could be measured by a meter placed on the American side of the Niagara River, but it is represented to us that practical operations developed the fact that the pressure was about 600 pounds to the square inch, and too great for the endurance of any meter.

"The collector reports that he was thereupon compelled to resort to the books of the appellants for evidence of the quantity imported, and the bills of the Ontario corporation furnished to the appellants accompany the entry of the merchandise, showing the number of feet of gas to correspond with the entry, and being approved by the appraiser at Buffalo.

"The quantity imported was approximately ascertained by the amounts shown to have been burned for the month, as recorded by the several private meters taking the gas from the Buffalo company. By a supplementary report the collector show that the embarrassment arising from the difficulty of measurement has lately been increased.

"This natural gas is now furnished for fuel to the city waterworks, and to large manufactories, and no reckoning is kept of the amount consumed, as the contract is made between the parties for an amount of fuel gas sufficient to operate the respective works at a price to be computed by the cost of the coal used during the preceding year.

"These several consumptions are not measured by meter or otherwise, but a large pipe is run into the furnace of such consumers, and the fuel gas flows in sufficient quantities to fulfill the terms of the contract. The customs officials allege that they are left without data other than the estimates of the company.

"On this state of things the suggestion is made that the collec-
142 tion of duty upon an article that can not now be measured, weighed, or gauged without depending upon the importer's estimate tends to bring the tariff laws and regulations into disrepute, and

that natural gas should be held to be free, and the letter of the Department is cited in reference to electricity transmitted by cable from the Canadian to the American side of the Niagara River to the effect that the same would not be liable to duty. (Synopsis 10086.)

"We can not sustain the two contentions of the protest that natural gas is free: (1) Because it is a crude bitumen, or (2) because it is a crude mineral.

"The appellants allege that the introduction of this gas does not affect American industries or interests. If this were a legitimate argument for our consideration, we might say that such contention does not seem to be reasonable. Indeed, the papers in the case before us show that it already comes into competition with American gas and coal, and that another company is laying a large main across the Niagara River to connect with the Canadian wells.

"The papers also reveal the fact that some natural gas is brought to Buffalo from Pennsylvania for consumption, the supply being limited on account of the distance.

"We are well aware of the fact that this useful agent can only be drawn from the pockets where nature has placed it. This is also true of the precious metals and of the precious stones, and it is not given us to know how soon these repositories may be enlarged, perhaps to so great an extent as to affect existing conditions.

"Besides, if natural gas can be imported free from the reasons given in the appellant's argument, why may not gas manufactured from coals subject to duty be claimed to be nondutiable when furnished to consumers by such methods as to make its measurement a matter of difficulty?

"Nor can we make this difficulty of measurement the ground for holding the article to be free.

143 "The method of computation, if not provided for by law, is a method of administration, which intelligent officers will reach under the direction of the Department, and for these reasons we hold that natural gas is dutiable at 10 per cent ad valorem, under section 4 of the existing tariff, as an unmanufactured article not enumerated.

"The decision of the collector is affirmed."

The matter came again before the Board upon a second protest, when additional testimony was adduced and new questions of law presented. The opinion was delivered May 20, 1893, and is as follows:

"Wilkinson, G. A.:

"The merchandise is natural gas imported at Buffalo from Canada by mains under the Niagara River, and is used as fuel and for illuminating purposes. It was assessed for duty as a nonenumerated unmanufactured article at 10 per cent under the act of October 1, 1890, and is claimed to be exempt from duty (1) on the ground that it is not an article within the meaning of the tariff; (2) as crude bitumen under paragraph 496, and (3) as a crude mineral under paragraph 651.

"In G. A. 744 the Board considered and overruled a protest similar to this. But no evidence was introduced in support of the claims, and attention was given chiefly to the first point. We reaffirm the ruling named as to the first and second points, but a lengthy and careful investigation of the subject leads to the conclusion that the third claim in the protest is well founded.

"The natural gas in question is similar to that produced in Pennsylvania and Ohio, but it was not imported prior to October 1, 1890. Consequently there are no precedents to serve as guides. Nor does it appear that at or prior to the passage of the present tariff act the dutiable
144 character of natural gas was ever considered in or out of Congress. Nor has there ever been any trade or popular designation which would indicate its proper classification for dutiable purposes.

"It is proper, therefore, to resort to the evidence of scientific experts and to other authorities bearing upon the question. In considering publications it is not believed that the date is of any moment, provided the source is impartial.

"At the several hearings in New York and in Washington, D. C., the Board examined a number of well-known geologists and chemists. While there was conflict in the testimony, the preponderance of the evidence was to the effect that natural gas is a crude mineral.

"Lexicographers and mineralogists give the word 'mineral,' in its primary and broadest sense, a definition which would embrace natural gas, although their secondary and limited definitions would not. Nothing appears in the tariff, however, to show that Congress intended the narrower, and not the broader, meaning.

"The question has recently been judicially determined in Canada. Section 565 of the municipal act of the Dominion empowers a township to lease or sell the right to take minerals under any highway. The town of Gosfield leased this privilege to the Kingsville Gas Company. The Ontario Gas Company asked for an injunction to restrain the sinking of the well, on the ground that natural gas is not a mineral. In his opinion, Judge Street, of the court of common pleas, stated that according to British authorities 'a reservation of minerals includes every substance which can be got from underneath the surface of the earth for the purpose of profit, unless there is something in the context or in the nature of the transaction to induce the court to give a more limited meaning,' and 'it has been laid down that the word "minerals," when used in a legal document or in an act of Parliament, must be understood in its widest signification, unless there is something in the context or in the
145 nature of the case to control its meaning. I think myself bound by the authorities to give to the word, when used in this act, its widest signification.' The motion was argued May 31, 1890. (The Ontario Reports, Vol. XIX, p. 591.)

"The case was carried to the court of appeals. Chief Justice Haggerty rendered the decision November 10, 1891. He said in part:

"'There was hardly any attempt to rebut or dispute the accuracy of scientific nomenclature in describing minerals as solid, liquid, and gas. The objection urged was that the legislature (especially at the date of the enactment) could not and did not include natural gas under the term "minerals." I can not see how we can qualify the words used by the legislature when there is nothing in the enactment to explain or limit their ordinary meaning. On full consideration, I have arrived at the opinion that our learned brother could not properly have come to any other conclusion than that natural gas falls within the meaning of minerals in the statute.' (Ontario Appeal Reports, vol. 18, pp. 626–632.)

"In the reports of the census, the U. S. Geological Survey, and various State authorities, natural gas is enumerated in the list of mineral products and mineral resources.

"The Statistical Abstract of the United States, prepared by the Treasury Department, gives on pages 53–55 a table of 'quantities and values of minerals produced in the United States during the calendar years from 1887 to 1891, inclusive.'

"In this category, under the heading of 'nonmetallic' on page 54, natural gas is named third in a list of forty, which includes solids and liquids as well as gas.

"We find that natural gas is a crude mineral, and sustain the claim that it is exempt from duty under paragraph 651, N. T."

146 The collector appeals from the conclusion reached by the board in its second decision exempting natural gas from duty.

William F. Mackey, asst. U. S. attorney, for the collector; Herbert P. Bissell, for the importer.

COXE, J.:

The Board of General Appraisers have considered the question involved with unusual care. It has been argued before them on two occasions. On the second hearing the evidence was so persuasive as to induce them to change their former ruling and hold that the natural gas in question was entitled to enter duty free. The court sees no reason to disturb this decision. Indeed, it is probable that were the issue to be decided here de novo a similar conclusion would be reached. But this is not the question. Even though the court should reach a different conclusion on the facts it would still be its duty to affirm the finding of the Board if fairly sustained by the proof.

If this were an appeal from a judgment entered upon the verdict of a jury, or the report of a referee in a common-law action, or of a master or commissioner in a chancery or admiralty suit, would the court grant a reversal upon the ground that the finding was against the weight of evidence?

This is the question now to be determined, and it is thought that it must be answered in the negative. There are many reasons why this rule should apply in these cases.

The Board is composed of a body of trained experts constantly passing upon questions of fact arising under the tariff laws, and having the great advantage of seeing and hearing the witnesses. Their findings upon the facts should not be lightly set aside.

147 The rule was enunciated soon after the Board was organized, and has been reiterated in a large number of decisions since.

It is said that the question whether or not natural gas is a crude mineral depends largely upon expert opinion. This is true of many controversies and especially those under the tariff laws. It is, nevertheless, a question of fact. For the reason already stated it is not thought necessary to discuss the scientific questions so ably presented by the briefs.

Had it been the intention of Congress to impose duty upon this volatile, invisible, and imponderable product of nature, which is incapable of being gauged, measured, or entered at the custom-house, as are other imported articles, it is difficult to believe that it would have been

left to the "catch all" clause in question. Although the record does not show that natural gas had been imported into this country prior to the act of 1890, it does show that it was well known at that date and had been an article of commerce for years and, of course, might at any time be brought to the United States from Canada or Mexico. Is it not fair to presume that had the lawmakers believed it subject to duty some definite provision would have been made for it in the statute? Even conceding the question to be doubtful, the doubt should be resolved in favor of the importer.

The decision of the Board should be affirmed.

(Indorsed:) Decision, Coxe, J. Filed March 13, 1896. W. S. Doolittle, clerk.

148 United States circuit court, northern district of New York.

In the matter of the Buffalo Natural Gas Fuel Company.

The application by the collector of customs of the port of Buffalo for a review of the decision of the Board of United States General Appraisers, rendered May 20th, 1893, sustaining the protest of the importer, the said The Buffalo Natural Gas Fuel Company, and holding that the natural gas brought into this country by pipe line under the Niagara River is a crude mineral and therefore exempt from duty under paragraph 651 of the tariff act of 1890, having been heard at a term of the circuit court of the United States, held at the United States court-house, in the city of Utica, in and for the northern district of New York, on the 18th day of February, 1896, and a decision of said circuit court having been made and filed on the 13th day of March, 1896, affirming the decision of the United States Board of General Appraisers.

Now, on motion of Bissell, Sicard, Bissell & Carey, attorneys for the respondent and importer, The Buffalo Natural Gas Fuel Company, it is hereby adjudged that the said decision reviewed by this court be, and the same hereby is, affirmed.

March 16, 1896.

ALFRED C. COXE, *U. S. J.*

(Indorsed): Judgment. Filed Mar. 16, 1896. W. S. Doolittle, clerk.

149 United States circuit court, northern district of New York.

In the matter of the Buffalo Natural Gas Fuel Company.

To the Judges of the United States Circuit Court of Appeals for the Second Circuit:

The petition of appeal of the United States of America, upon the application of the Attorney-General of the United States, respectfully shows to the court:

That final judgment was lately made in the circuit court of the United States for the northern district of New York, and duly entered in the office of the clerk of said court, on the 16th day of March, 1896, upon a decision duly rendered by said court, Hon. Alfred C. Coxe, district

judge, presiding, on the 13th day of March, 1896, wherein the decision of the Board of General Appraisers of the United States, rendered May 20th, 1893, sustaining the protest of the Buffalo Natural Gas Fuel Company, the importer, as to the rate of duty to be assessed upon natural gas imported from Canada per pipe line under the Niagara River, and holding that the said natural gas is a crude mineral and therefore exempt from duty under paragraph 651 of the general tariff act of 1890, was sustained and affirmed.

That said judgment of the said circuit court, and the whole thereof, as these appellants are advised, is erroneous and ought to be reversed.

150 Wherefore, the United States, appellants, pray that said judgment be reversed, and that a judgment be entered in favor of the appellants reversing the said decision of the said Board of General Appraisers and dismissing the protest of the said The Buffalo Natural Gas Fuel Company.

And these appellants as in duty bound will ever pray.

Dated, Buffalo, N. Y., April 10th, 1896.

JUDSON HARMON,
Attorney-General of the United States.
By WILLIAM A. POUCHER,
United States Attorney for the Northern District of New York.

The United States are hereby allowed to appeal to the circuit court of appeals for the second circuit, from the judgment entered in the circuit court clerk's office, for the northern district of New York, on the 16th day of March, 1896, affirming the decision of the Board of General Appraisers rendered May 20th, 1893, as to the rate of duty on natural gas imported from Canada by pipe line under the Niagara River.

Dated April 14, 1896.

ALFRED C. COXE,
United States District Judge.

(Indorsed): Petition on appeal. Filed on Apr. 14, 1896. W. S. Doolittle, clerk.

151 United States circuit court of appeals for the second circuit.

THE UNITED STATES OF AMERICA, PLAINTIFFS in error,
against
THE BUFFALO NATURAL GAS FUEL COMPANY, defendant in error.

Notice is hereby given that the United States of America, upon the application of the Attorney-General of the United States, by William A. Poucher, United States attorney for the northern district of New York, having made an application to the Hon. A. C. Coxe, U. S. district judge, for leave to appeal from the judgment entered in the office of the clerk of the United States circuit court for the northern district of New York, on the 16th day of March, 1896, affirming the decision of the Board of United States General Appraisers, made May 20th, 1893, as to the rate of duty on natural gas imported from Canada per pipe line under Niagara

River, and said appeal having been duly allowed, feeling aggrieved by said judgment, does hereby appeal therefrom to the circuit court of appeals for the second circuit.

Dated, Buffalo, April 13th, 1896.

Yours, etc.,

JUDSON HARMON,
Attorney-General.
By WILLIAM A. POUCHER,
U. S. Attorney, Atty. for U. S.,
907 D. S. Morgan Bldg., Buffalo, N. Y.

To Messrs. BISSELL, SICARD, BISSELL & CAREY,
Attys. for Buffalo Natural Gas Fuel Company, Deft. in Error, and
W. S. DOOLITTLE, Esq.,
Clerk U. S. Circuit Court.

152 (Indorsed:) Notice of appeal. Due and personal service of a copy of the within notice of appeal is admitted this 16th day of April, 1896. Bissell, Sicard, Bissell & Carey, attorneys for deft. in error. Filed Apr. 17, 1896. W. S. Doolittle, clerk.

United States circuit court of appeals for the second circuit.

THE UNITED STATES OF AMERICA, PLAINTIFFS in error,
against
THE BUFFALO NATURAL GAS FUEL COMPANY, defendant in error.

Assignment of errors.

The United States of America, the plaintiffs in error herein, upon the application of the Attorney-General of the United States, by William A. Poucher, United States attorney in and for the northern district of New York, says that in the record and proceedings in this cause, and in the final decree therein, there is manifest error in the following, among other particulars:

1st. That the judgment aforesaid, in form aforesaid given, was given for the said defendant in error, whereas, by the law of the land the said judgment should have been given for the said plaintiffs in error and against the said defendant in error.

153 2nd. That the judge erred in finding that the defendant in error was entitled to recover of the plaintiffs in error, and in directing the judgment aforesaid, in the form aforesaid given, to be entered in favor of the said defendant in error and against said plaintiffs in error. And the plaintiffs in error pray that the judgment aforesaid, for the errors aforesaid and other errors in the record and proceedings aforesaid, may be reversed, annulled, and altogether held for nothing, and that the said plaintiffs in error may be restored to all things which they have lost by occasion of said judgment, etc.

Dated, Buffalo, April 10th, 1896.

JUDSON HARMON,
Attorney-General of the United States.
By WILLIAM A. POUCHER,
United States Attorney for the Northern District of New York.

(Indorsed:) Assignment of errors. Presented April 14th. A. C. C. Filed Apr. 14, 1896. W. S. Doolittle, clerk.

154 UNITED STATES OF AMERICA,
Northern District of New York, ss:

By the Honorable Alfred C. Coxe, one of the judges of the United States courts for the northern district of New York.

To THE BUFFALO NATURAL GAS FUEL COMPANY, of Buffalo, New York, greeting:

You are hereby cited and admonished to be and appear at the United States circuit court of appeals for the second circuit, to be holden at the city of New York, on the 13th day of May, 1896, to show cause, if any there be, why the judgment lately rendered by the circuit court of the United States for the northern district of New York, affirming the decision of the Board of General Appraisers of the United States, as to the rate of duty on natural gas imported by you per pipe line under the Niagara River from Canada, from which said judgment the United States of America has lately appealed to the circuit court of appeals for the second circuit, should not be corrected and reversed, and to do and receive what may appertain to justice to be done in the premises.

Given under my hand, at the city of Utica, in said northern district of New York, the 14th day of April, 1896.

ALFRED C. COXE,
Judge of the United States District Court.

(Indorsed:) U. S. circuit court of appeals, second circuit. The United States, plffs. in error, vs. The Buffalo Natural Gas Fuel Company, dft. in error. Citation. Judson Harmon, Attorney-General, by W. A. Poucher, U. S. attorney, 907 D. S. Morgan Bldg., Buffalo, N. Y. Due and personal service of a copy of the within citation is admitted, this 16th day of April, 1896. Bissell, Sicard, Bissell & Carey, attorneys for deft. in error. U. S. circuit court, N. D. of N. Y. Filed April 17, 1896. W. S. Doolittle, clerk.

155 UNITED STATES OF AMERICA,
Northern District of New York, ss:

I, William S. Doolittle, clerk of the circuit court of the United States of America, for the northern district of New York, in the second circuit, do hereby certify that the foregoing pages, numbered from 1 to 156, inclusive, contain a true and complete transcript of the record and proceedings had in said court, in the matter of the application of the collector of customs at Buffalo, New York, for a review of the decision of the Board of General Appraisers, as to the rate and amount of duty on certain merchandise imported by the Buffalo Natural Gas Fuel Company, as the same remain of record and on file in said office and have been stipulated by the attorneys of the respective parties.

In testimony whereof I have caused the seal of said court to be hereunto affixed, at the city of Utica, in the northern district of New York,

in the second circuit, this twenty-third day of April in the year of our Lord one thousand eight hundred and ninety-six, and of the Independence of said United States the one hundred and twentieth.

[SEAL.] W. S. DOOLITTLE, *Clerk.*

156 United States circuit court of appeals for the second circuit—October term, 1896. Appeal from the circuit court of the United States for the northern district of New York.

[Submitted December 16, 1896. Decided January 7, 1897.]

THE UNITED STATES, APPELLANT,
vs.
THE BUFFALO NATURAL GAS FUEL COMPANY, appellee. } No. 46.

Before Judges Wallace, Lacombe, and Shipman.

This is an appeal from a decision of the circuit court, northern district of New York, affirming a decision of the Board of General Appraisers, which reversed the decision of the collector of the port of New York assessing a rate of duty upon natural gas. The gas, which is obtained by boring into the ground, comes from Shirkstown, in the Dominion of Canada, about twelve miles from Buffalo. It is conveyed through pipes to and across the Niagara River and is thus imported into the city of Buffalo and there used in the same form in which it is taken from the earth. The importation in question was on August 1st and 4th and November 21, 1891.

LACOMBE, circuit judge:

The tariff act in force at the date of this importation was what is known as the McKinley Act, and was passed October 1, 1890. Prior to its passage natural gas had been obtained from the earth by boring or drilling in many different localities within the United States, had
157 been bought and sold commercially, and had gone into use extensively; but up to October 1, 1890, none had ever been imported. It is not mentioned by name in the tariff act, nor is it specifically enumerated therein. The collector assessed it as dutiable at 10% under sec. 4 of the act as a "raw or unmanufactured article not enumerated or provided for." The importers protested, insisting that it was enumerated in one or other of the two following paragraphs of the free list:

"496. Asphaltum and bitumen, crude."

"651. Minerals, crude, or not advanced in value or condition by refining or grinding, or by other processes of manufacture, not specially provided for in this act."

The Board of General Appraisers found that natural gas was a crude mineral and exempt from duty under paragraph 651, and the circuit court has sustained that decision.

Much testimony from scientific men, geologists, mineralogists, and chemists was introduced upon the hearing before the Board. It is interesting, but not especially helpful to a determination of the question presented here. In the "interpretation of the revenue laws, words are to be taken in their commonly received and popular sense, or according to

their commercial designation, if that differs from the ordinary understanding of the word." Lutz v. Magone (153 U. S., 105). In U. S. v. Breed (1 Sumn., 156) Mr. Justice Story, referring to 9 Wheat., 430, says: "It was there held that in construing revenue laws we were to consider the words not as used in the scientific or technical sense, where things are classified according to their scientific characters and properties;" and "laws of this sort taxed things by their common and usual denominations among the people, and not according to their denominations among naturalists or botanists or men of science."

Reference may also be had to Robertson v. Salomon (130 U. S., 412), Nix v. Hedden (149 U. S., 304), and Lutz v. Magone (153 U. S., 105). In two of these cases shelled beans, although shown to be "seeds" in the language of botany, and tomatoes, although botanically they
158 were "fruit," were both held to be "vegetables" within the meaning of that word in the tariff act. In the third case it was held that saccharine, a substance three hundred times as sweet as sugar, although scientifically an "acid" was not an acid for revenue purposes.

There is no evidence in the record of any special trade meaning of the words "crude minerals."

We are left then to determine the meaning of these words from judicial knowledge of the ordinary meanings of words of common speech, unless there is sufficient in the record to show that some modification of their ordinary signification was in the mind of Congress when it passed the act. If the question whether the word "minerals" in ordinary speech would include such an article as natural gas were to be settled solely from reference to the dictionaries, its solution might not be easy. In view, however, of the various official publications by the Federal Government set forth in the record and which are not intended for scholars or scientific men, but to give to Congress and the people the best knowledge the compilers can, there can be little doubt as to what Congress understood to be the scope and meaning of the words, a scope and meaning which is within some at least of the definitions of the lexicographers.

For several years prior to the passage of the tariff act of 1890 there has been prepared each year by the Bureau of Statistics in the Treasury Department a so-called Statistical Abstract of the United States. It is prepared under the direction of the Secretary of the Treasury and contains statistics of finance, coinage, commerce, &c. It is printed each year at the Government Printing Office and transmitted by the Secretary of the Treasury to the House of Representatives. These abstracts each contain tables giving the "qualities and values of minerals produced in the United States" during the five or six years immediately preceding the year of publication. In the table contained in the Statistical Abstract of 1888, minerals are divided into metallic and nonmetalllic. Of the latter class 35 species are enumerated and the sixth on the list is
159 "natural gas," appearing between petroleum and cement. The same is true of the Statistical Abstracts of 1889 and 1890. It thus appears that the reports, to which it is to be supposed that Congress refers for enlightenment as to the statistics of the products of this country, used the word "minerals" in a sense broad enough to include natural gas; and if there be any doubt as to the ordinary meaning of that word, it is to be presumed that Congress when legislating as to the rates

of duty to be laid upon the products of other countries used such word with a meaning equally comprehensive.

We do not undertake in this case to decide whether or not natural gas is a "crude bitumen;" if it be such the provisions of paragraph 496 would control its classification, being more specific than those of paragraph 651. Both paragraphs are in the free list, and since natural gas comes fairly within the general provision for crude minerals, and is therefore free, it is unnecessary now to inquire whether it is also within the more specific description "crude bitumen," which is also free. The Board of General Appraisers properly reversed the collector's assessment of the article for duty; it is not a "raw or unmanufactured article not enumerated."

The decision of the circuit court is affirmed.

Edward B. Whitney, Assistant Attorney-General, and William A. Poucher, United States attorney, for the appellant. Herbert B. Bissell for the appellee.

160 United States circuit court of appeals for the second circuit, October term, 1896. Appeal from the circuit court of the United States for the northern district of New York.

[Submitted December 16, 1896. Decided January 7, 1897.]

THE UNITED STATES, APPELLANT,
vs.
THE BUFFALO NATURAL GAS FUEL COMPANY, appellee. } No. 46.

Before Judges Wallace, Lacombe, and Shipman.

WALLACE, Circuit Judge:

I concur in an affirmance in this case, but not for the reasons given in the prevailing opinion. In scientific classification natural gas may be considered a mineral, but in the tariff act the term minerals is to be read in its common acceptation in the absence of a different commercial signification, and does not, I think, include a gas, but means something which in ordinary parlance is mined. I think the importation in controversy should be classified under the provision of the free list which exempts from duty "asphaltum and bitumen, crude." If it belongs there, as this is the more specific term of description, it is excluded from the category of "minerals, crude." According to the testimony in the record, bitumen is a generic term applied to a large number of natural substances which consist largely or chiefly of hydrocarbons. This substance may be gaseous, as natural gas or marsh gas; fluid, as petroleum or naph-
161 tha; viscous, as the semifluid asphaltum; or solid, as some forms of asphaltum. According to McCulloch's Commercial Dictionary, bitumen includes a considerable range of inflammable mineral substances burning with the flame in the open air, which differs in consistency from a thin fluid to a solid. He says, "Near the village of Amiano, in the state of Parma, there exists a spring which yields this substance in a sufficient quantity to illuminate the city of Genoa, for which purpose it is employed."

Edward B. Whitney, Assistant Attorney-General, and William A. Poucher, United States attorney, for the appellant. Herbert B. Bissell, for the appellee.

162 UNITED STATES OF AMERICA,
Southern District of New York, ss:

I, James C. Reed, clerk of the United States circuit court of appeals for the second circuit, do hereby certify that the foregoing pages, numbered from one to one hundred and sixty-one, inclusive, contain a true and complete transcript of the record and proceedings had in said court in the case of the United States, appellant, against the Buffalo Natural Gas Fuel Company, appellee, as the same remain of record and on file in my office.

In testimony whereof I have caused the seal of the said court to be hereunto affixed, at the city of New York, in the southern district of New York, in the second circuit, this sixteenth day of February, in the year of our Lord one thousand eight hundred and ninety-seven and of the Independence of the said United States the one hundred and twenty-first.

[SEAL.] JAMES C. REED, *Clerk.*

163 UNITED STATES OF AMERICA, *ss:*

The President of the United States of America to the honorable the judges of the United States circuit court of appeals for the second circuit, greeting:

Being informed that there is now pending before you a suit in which the United States is appellant and the Buffalo Natural Gas Fuel Company is appellee, which suit was removed into the said circuit court of appeals by virtue of an appeal from the circuit court of the United States for the northern district of New York, and we, being willing for certain reasons that the said cause and the record and proceedings therein should be certified by the said circuit court of appeals and removed into
164 the Supreme Court of the United States, do hereby command you that you send without delay to the said Supreme Court, as aforesaid, the record and proceedings in said cause, so that the said Supreme Court may act thereon as of right and according to law ought to be done.

Witness the Honorable Melville W. Fuller, Chief Justice of the United States, the 20th day of March, in the year of our Lord one thousand eight hundred and ninety-seven.

[SEAL.] JAMES H. MCKENNEY,
Clerk of the Supreme Court of the United States.

165 (Indorsed:) Supreme Court of the United States. No. 724. October term, 1896. The United States vs. The Buffalo Natural Gas Fuel Co. Writ of certiorari.

166 In the Supreme Court of the United States, October term, 1896.

THE UNITED STATES, APPELLANT,
vs. } No. 724.
THE BUFFALO NATURAL GAS FUEL COMPANY.

Stipulation.

It is hereby stipulated between counsel for the parties to the above-entitled cause that the certified copy of the record of the cause in the

United States circuit court of appeals for the second circuit, now on file in the Supreme Court of the United States, may be treated as the return to the writ of certiorari issued therein.

HOLMES CONRAD,
Solicitor-General.

HERBERT P. BISSELL,
Counsel for Appellee.

(Endorsed:) United States circuit court of appeals, second circuit. Filed Mar. 27, 1897. James C. Reed, clerk.

167 *To the Honorable the Supreme Court of the United States:*

The record and all proceedings in the cause whereof mention is within made having been lately certified and filed in the office of the clerk of the Honorable the Supreme Court of the United States, a certified copy of the stipulation of counsel is hereto annexed, and under the direction of counsel for the appellant said stipulation is certified as a return to this writ.

New York, March 27th, 1897.

[SEAL.] JAMES C. REED,
Clerk of the United States Circuit Court of Appeals for the Second Circuit.

168 (Indorsed on cover:) Case No. 16503. Term No. 314. The United States, petitioner, *vs.* The Buffalo Natural Gas Fuel Co. Writ of certiorar' and return. Supreme Court U. S. October term, 1897. Office Supreme Court U. S. Filed Mar. 29, 1897. James H. McKenney, clerk.